ABSTRACTS

Monday Morning — April 10, 2000

8:30 EIS Headline News. Moderator: Jeffrey P. Koplan

8:35 ***Denis Nash, F. Mostashari, K. Murray, D. O'Leary, A. Fine, J. Miller, G. Campbell, J. Roehrig, D. Gubler, P. Smith, M. Layton***

Recognition of an Outbreak of West Nile Virus Disease — New York City, 1999

Background: Beginning in August 1999, overlapping human and avian West Nile Virus (WNV) disease outbreaks occurred in New York City (NYC), representing the first recognized occurrence of WNV in the western hemisphere. The human outbreak was recognized after a physician called the NYC Department of Health (NYCDOH) on August 23 to report an unusual encephalitis cluster. Epidemiologic and laboratory investigations quickly identified an arboviral etiology, and mosquito control measures were rapidly implemented. Recognition of the avian-human link was made in late September when WNV was isolated from dead birds submitted by concerned veterinarians.

Methods: Case-finding efforts identified patients hospitalized with possible WNV infection. Serologic specimens were tested by IgM/IgG-capture enzyme-linked immunosorbent assay for WNV antibodies. Chart reviews and patient interviews were completed on seropositive patients.

Results: We identified 43 serologically confirmed WNV cases in NYC. The median age was 71 years (range, 5–90). Four deaths occurred (9%), all among elderly patients. Clinical illness included encephalitis with profound muscle weakness (40%), encephalitis (23%), viral meningitis (25%), and fever with headache (13%). Sixteen patients (40%) reported potential mosquito breeding sites nearby, and 7 (17%) noticed dead birds around their homes before illness onset. Of 21 WNV cases with onset prior to the recognition of the outbreak, only 5 were reported to the NYCDOH, all by the same physician.

Conclusions: Unusual features of this outbreak included the prominence of severe muscle weakness as a clinical finding and WNV-associated avian pathogenicity. Physician reporting was essential to the early detection and control of this outbreak. These findings emphasize that health departments should actively cultivate relationships with the clinical community and engage nontraditional partners (e.g., wildlife veterinarians) in disease surveillance.

8:55 ***Lynn R. Zanardi***

Multi-State Investigation of Intussusception Among Recipients of Rotavirus Vaccine

Background: Rotavirus is a cause of severe gastroenteritis affecting children worldwide. In August, 1998 a vaccine for rotavirus gastroenteritis (RRV-TV) was licensed for routine use among infants in the U.S., and was subsequently incorporated into the recommended childhood immunization schedule. From November 1, 1998 to July 7, 1999, 15 cases of intussusception following receipt of rotavirus vaccine were reported to the Vaccine Adverse Event Reporting System, prompting temporary suspension of use of RRV-TV.

Methods: To estimate the risk of intussusception among RRV-TV vaccinated versus unvaccinated infants, a matched case control design was utilized. Intussusception cases were identified in the 19 states with highest

vaccine distribution through review of medical and radiology records coded for intussusception. Four age-matched controls per case were identified from the case birth hospital. Vaccination status was verified with the provider for cases and controls.

Results: Interim analysis of data from 427 cases and 1619 controls estimated the risk of intussusception among ever versus never RRV-TV vaccinated children at an odds ratio (OR) of 1.8 (95% Confidence Interval [CI]=1.3–2.6). The risk was highest 3–7 days following receipt of the first dose of vaccine (OR=24.8, 95% CI=9.5–65.1). Significant increases in risk were also seen 8–14 days following the first dose of RRV-TV (OR=7.1, 95% CI=2.3–21.9), and 3–7 days following the second dose of RRV-TV (OR=13.4, 95% CI=92.6–69.0).

Conclusions: The risk of intussusception among infants was substantially increased following receipt of the first two doses of rotavirus vaccine. Given the magnitude of risk and the severity of intussusception, the recommendation for use of RRV-TV was withdrawn and the vaccine was voluntarily removed from the market.

9:15 ***Sophia S. Wang, K. Sheedy, F. Fridinger, H. Linnan, M. Khoury***
Public Attitudes Regarding the Donation and Storage of Blood Samples for Genetic Research

Background: Sequencing of the human genome will make epidemiologic studies that assess associations between genetic polymorphisms and human diseases a high priority. Recruiting participants for population-based studies requiring DNA analysis of blood specimens will be crucial; we therefore investigated factors contributing to favorable attitudes towards participating in studies in which blood samples are drawn and stored for genetic research.

Methods: We analyzed data from the 1998 American Healthstyles Survey on health attitudes/behavior. Participants are representative of U.S. adults on age, sex, marital status, race, income, geography, and population density. The 1998 survey included questions about blood donation/storage for genetic research. We compared individuals willing to donate/store blood samples for genetic research with those unwilling to do so, generating adjusted odds ratios (AOR) from logistic regression models.

Results: Of 3,130 survey participants, 2,621 (84%) completed questions regarding genetic research; 42% (group A) would donate and allow long-term storage of blood samples for genetic research; 37% (group B) would donate or store blood if confidentiality/anonymity were assured; 21% (group C) would not donate/store blood under any circumstance. When we compared group A with group C, we found that factors associated with favorable attitudes included education beyond high school (AOR:1.5), family history of genetic disorder (AOR:1.5), residence in the West (AOR:1.9), and White/non-Hispanic race (AOR:1.4) ($p<0.05$).

Conclusions: These data show that substantial concern exists about blood donation/storage for genetic research. The correlation between attitudes toward genetic research with various sociodemographic factors raises concerns that genetic epidemiologic studies may not be representative of the underlying population. Understanding these factors will help researchers communicate genetic research goals to the public and aid recruitment efforts for population-based genetic studies.

9:35 ***Peter Salama, P. Spiegel***
Mortality Among Kosovar Albanians During a Prolonged Conflict in Kosovo, 1998–1999

Background: War is ranked 16th in the global burden of disease. Understanding mortality due to modern warfare, in which 90% of casualties are civilian, and identifying vulnerable civilian groups are of critical public health importance. Reliable mortality data, however, are rarely available in war-time.

Methods: In September 1999, we conducted a two-stage cluster survey in Kosovo that included 1,197 households and 8,605 people. We collected retrospective mortality data, including cause of death, for the period of the conflict (February 1998 – June 1999).

Results: From February 1998 to June 1999, 67 (64%) of 105 deaths in the sample population were attributed to war-related injuries, corresponding to 12,018 (95% Confidence Interval [CI] = 5,486–18,288) deaths in the total population. The crude mortality rate increased from a pre-war baseline of 0.31/1,000/month to 0.72/1,000/month during the conflict. Mortality rates peaked in April 1999 at 3.3/1000/month, coinciding with an intensification of the Serbian "ethnic cleansing" campaign. Compared with the rest of the population, men 20 to 50 years of age were more than twice as likely (Relative Risk [RR] = 2.7, 95% CI = 1.7–4.4), and men 60 years and older, more than 11 times as likely (RR = 11.2, 95% CI = 6.8–18.5) to die of war-related trauma.

Conclusions: War-related injuries accounted for the majority of deaths in Kosovo during the conflict. Raising awareness among the international humanitarian community of the increased risk for war-related injuries among the elderly in some settings is an urgent priority. Establishing evacuation programs to assist the elderly in finding refuge may prevent loss of life. Such mortality data could be used as evidence that governments and armies have violated international standards of conduct during warfare.

10:15 Behavior and Health. Moderator: William H. Dietz

10:20 *Elizabeth Lyon Hannah, R. Rickard, R. Hoffman, R. Moolenaar*
Trends in Behavioral Risks and Outcomes for Cardiovascular Disease — Colorado, 1990–1998

Background: Cardiovascular diseases (CVD) result in significant morbidity and mortality in the US. In Colorado, behavioral risks for CVD which can be personally influenced, such as obesity, smoking, and physical inactivity, have been targeted for reduction through public education campaigns. The purpose of this study was to determine how behavioral risk factors for CVD have changed and how these trends correlate with hospitalizations and deaths from acute myocardial infarction (AMI) and stroke.

Methods: We examined Colorado Behavioral Risk Factor Surveillance System, hospital discharge, and death certificate data from 1990–1998. Annual statewide prevalence estimates of smoking, obesity, and sedentary behavior for adults were calculated. Unduplicated hospital admissions for AMI and stroke were used to calculate annual rates of hospitalization. Death certificate data were used to calculate annual death rates for AMI and stroke. Linear regression was used to analyze trends; the Spearman rank test was used for assessing correlations.

Results: Increases in the prevalence of obesity (16.5% to 27.2%, p-value<0.01) and sedentary lifestyle (44.5% to 50.9%, p-value<0.025) were noted over the study period. Prevalence of smoking remained unchanged. Rates of hospitalization for AMI increased significantly (p-value<0.01) and for stroke remained stable. Deaths due to AMI decreased significantly (p-value<0.001). Deaths due to stroke increased significantly (p-value<0.05), but were driven by the increase in stroke rates in persons ≥85 years (p-value<0.03). Obesity prevalence was positively correlated with AMI hospitalization across the study period (p-value<0.02).

Conclusions: Education and public awareness campaigns have not led to decreasing rates of smoking, obesity, or sedentary lifestyle in Colorado. These findings are consistent with the increase in hospitalizations for AMI. Improvements in clinical care may explain the decreasing death rates from AMI.

10:40 *Mary Ellen Simpson, D. Galuska, M. Serdula, C. Gillespie, R. Donehoo, C. Macera*
Small Strides in Walking for Leisure Time Physical Activity Among U.S. Adults, 1987– 1998

Background: Americans can substantially improve their health and quality of life by engaging in regular physical activity. The Surgeon General's report *Physical Activity and Health* recommends at least 30 minutes of physical activity on most days of the week. Walking has been recommended because it is both economical and accessible. We examined trends in walking by sex, age, and racial and ethnic groups.

Methods: Data from 31 states participating in the Behavioral Risk Factor Surveillance System (BRFSS), an ongoing telephone survey of health behaviors among adults from 1987 to 1998 were pooled (N = 572,648). Walkers were defined as participants who reported walking as one of the two leisure-time physical activities they participated in most frequently during the past month.

Results: During all survey years, walking was the most frequent leisure-time physical activity among all sex, age, and racial and ethnic groups. Furthermore, the prevalence of walking was highest among women and the middle and older age-groups. However, only one-fifth of walkers walk at least 5 times per week and 30 minutes per occasion. From 1987 to 1998, the prevalence of walking increased from 40.8% to 45.1% among women and 27.3% to 29.8% among men. The largest increases were observed among adults aged 45–54 years and among African Americans.

Conclusions: Walking is the preferred physical activity among all Americans. Relative to 1987, Americans were walking more often in 1998, particularly African Americans and middle-aged persons. Nevertheless, larger strides will be needed to meet national guidelines. Individual and environmental barriers to walking need to be identified and addressed.

11:00 ***Juan Carlos Zevallos, C. Alo, P. Huang***
Cigarette Access and Use by Minors — Texas, 1998–1999

Background: The Texas Tobacco Law went into effect in January 1998 in response to increasing use of tobacco products by adolescents. The law specifically prohibits persons under 18 years of age from purchasing or possessing tobacco products. We examined cigarette access and use by youth after implementation of the law.

Methods: Data were analyzed from the Texas Youth Tobacco Survey conducted in spring of 1998 and 1999. The survey included a statewide representative sample of 15,000 public middle and high school students in 1998 and 10,500 in 1999. Confidence intervals (CI) were calculated using SUDAAN.

Results: Current cigarette use among public middle school students decreased by 27.7%, from 20.5% (95% CI 18.6 – 22.6) in 1998 to 14.8% (CI 12.6 –17.0) in 1999. The proportion of middle school students who reported buying cigarettes in a store in 1999 (4.3% [CI 2.3 – 6.2]) was lower than the proportion in 1998 (12.8% [CI 10.2 – 15.4]). A similar decrease was noted in purchases from vending machines in 1999 (1.6% [CI 0.6 – 2.5]) as compared with the year before (4.8% [CI 3.0 – 6.6]). However, obtaining cigarettes "in some other way" increased from 13.6% (CI 11.3 – 16.0) in 1998 to 22.6% (CI 18.0 – 27.3) in 1999. No substantial differences in cigarette use or access source were observed among high school students in these two years.

Conclusions: Cigarette access and use patterns have recently changed among middle school students in Texas; this change may be partly explained by the new tobacco control law. The Youth Tobacco Survey should continue monitoring trends in cigarette access and use by minors. The absence of change among high school students warrants further research.

11:20 ***Michael J. Cooper, M.S. Eberhardt***
Caffeine Consumption Among Adults on Anxiolytic Therapy — United States, 1988–94

Background: In 1997, over 41,000 hospitalizations were attributed to the misuse of anxiolytic medications. These drugs are typically used to treat anxiety and sleep disorders. Caffeine consumption may be inappropriate for individuals being treated with anxiolytic medications given research that suggests caffeine is antagonistic to the therapeutic action of anxiolytic drugs. To determine the prevalence and the factors associated with concomitant use, we examined data from the third National Health and Nutrition Examination Survey (NHANES III).
Methods: NHANES III was conducted by the National Center for Health Statistics on a nationally representative sample (n=20050) of civilian, noninstitutionalized, U.S. adults. During interviews, respondents were asked to self-report their prescription drug use in the month prior to the survey. For this analysis, caffeine use was limited to food frequency responses for caffeinated tea and coffee among adults >17 years of age.
Results: Approximately 3% (n= 628) reported using anxiolytic medications with a median age of 66 years and a median length of use of approximately 4 years. Nearly 69% were women. Eighty percent of those using these medications reported monthly use of either caffeinated tea or coffee (17% reported low exposure [1–29 cups/month] 35% reported medium exposure [30 cups/month] and 28% reported high exposure [>30 cups/month]). Caffeine consumption did not vary by sex, education or geographic location.
Conclusions: Caffeine use is common among individuals using anxiolytic drugs. This is not surprising given previous research that indicates that physicians rarely ask about caffeine consumption when prescribing these drugs and the general lack of information on this topic in the public domain. Improved educational efforts are needed for both patients and prescribers regarding the concomitant use of anxiolytic medications and caffeine.

Monday–Tuesday Poster Session

12:30 Poster Session No. 1 — Meet the Authors

Bacterial Diseases

P1. ***Jairam R. Lingappa, N. Rosenstein, E. Zell, K. Shutt, A. Schuchat, B. Perkins, the Active Bacterial Core Surveillance (ABCs) Team of the Emerging Infections Program***
Surveillance for Meningococcal Disease and Strategies for Use of Conjugate Meningococcal Vaccines in the United States

Background: Meningococcal disease (MD), an important cause of sepsis and meningitis in the U.S., is associated with high morbidity, mortality and substantial public health impact. The available vaccine is not effective in young children, who are at highest risk of disease. Improved meningococcal conjugate (MenCon) vaccines against some serogroups of meningococci will soon be available. We compared the burden of MD with pneumococcal disease (PD) and examined the potential impact of MenCon vaccines.
Methods: Active population-based surveillance was conducted in selected U.S. areas (population ~30,000,000) from 1990–1998 for meningococcal and pneumococcal disease. MD and PD cases were defined by isolation of the bacteria from normally sterile sites; meningitis was defined as isolation from cerebrospinal fluid or clinical meningitis. We modeled infant, toddler and adolescent immunization using serogroup C or C+Y MenCon vaccine. We assessed impact by measuring cumulative incidence and incidence 10 years after initiating vaccination.

Results: Incidence of MD was highest in <2 year-olds, declined through childhood and increased among adolescents. Serogroups B, C and Y accounted for 27%, 36%, and 29% of MD, respectively. During the first 22 years of life, MD caused 48% of combined meningococcal and pneumococcal mortality, but only 9% of combined invasive disease. Use of C+Y MenCon vaccine in infant, toddler and adolescent strategies could reduce cumulative incidence of MD by 54%, 49%, and 25%, respectively; the toddler strategy had a greater impact per dose of vaccine. Ten years after implementing vaccination, MenCon vaccine could reduce MD by 53% and deaths by 65%.

Conclusions: While the choice of vaccination strategy must also consider available vaccine formulations and programmatic issues, use of MenCon vaccine should markedly reduce rates of MD.

P2. ***Juliette Morgan, E. Kaczmarski, J. Stuart, T. Popovic, M. Guiver, K. Shutt, H. Orr, B. Perkins, N. Rosenstein***

Evaluation of Polymerase Chain Reaction (PCR)-based Diagnosis of Invasive Meningococcal Disease in England

Background: England recently began routinely vaccinating infants against serogroup C meningococcal disease, a leading cause of death among young children. The need to determine accurately the burden of meningococcal disease highlights the importance of improved diagnostic methods. Diagnosis traditionally relied on culture of *Neisseria meningitidis*; newly developed polymerase chain reaction (PCR) testing was introduced and we performed this study to assess its effectiveness.

Methods: We reviewed medical records of 274 patients in South/West England for whom PCR had been performed on blood and/or cerebrospinal fluid (CSF) during June to December 1998. Initial screening PCR assays targeted the capsular transport gene (*ctrA)*; reactive specimens were tested by PCR for the sialyltransferase (*siaD*) gene to determine serogroup. A culture-confirmed case was defined as positive blood or CSF culture from a sterile site. A possible meningitis case was defined as negative culture, but with meningismus, altered mental status and fever, or CSF consistent with bacterial meningitis.

Results: All 274 patients had specimens submitted for both culture and PCR. Twenty-nine persons had positive cultures and 45 had a positive PCR. For culture-confirmed cases, PCR sensitivity was 50% (95% confidence interval [CI] 28–72%), and specificity 84% (95% CI 78–89%). For possible meningitis cases, CSF PCR sensitivity was 63% (95% CI 41–81), and specificity 88% (95% CI 75–96). Nine of 14 patients with possible meningitis were laboratory confirmed by PCR.

Conclusions: Despite suboptimal sensitivity, PCR has increased overall laboratory-confirmed cases of meningococcal disease in England by 33% during 1998. Modifications to the PCR technique since this investigation have demonstrated marked improvement in sensitivity and while further advances are needed, PCR could be an important tool for surveillance in the U.S.

P3. ***Andrea L. Benin, R. Benson, K. Arnold, A. Fiore, E. Brown, P. Cook, K. Williams, V. Galvin, B. Fields, R. Besser***

Outbreak of Travel-Related Legionellosis Associated With a Whirlpool Spa — Georgia, 1999

Background: In the United States, 10,000–20,000 Legionnaires' disease (LD) cases occur each year. The proportion that are travel-related is not well defined but may be high. We investigated a travel-associated LD and Pontiac fever (PF) outbreak identified because the index cases occurred in an extended family from 2 states who stayed at a Georgia hotel.

Methods: We conducted case-finding among guests who stayed at the hotel from April 1 to May 18, 1999, an environmental investigation, and a cohort study of guests exposed to the pool area during the weekend that the index patient stayed at the hotel. Sera from cohort study guests were tested for IgM against the index LD patient's *Legionella pneumophila* isolate.

Results: We identified 2 LD cases and 22 PF cases among 414 hotel guests. *Legionella pneumophila* serogroup 6 (Lp6) was isolated from the index patient and the hotel whirlpool. New molecular subtyping techniques demonstrated that the Lp6 isolates were identical. Of 55 cohort study participants, 2 had LD and 10 had PF. Disease occurred in 10 (38%) of 26 whirlpool-exposed guests compared to 2 (7%) of 29 guests who did not enter the whirlpool (RR= 5.6, *P*=0.005). IgM antibodies to the outbreak Lp6 strain were detected in 4 (44%) of 9 PF cases and 2 (6%) of 32 non-ill persons (*P*=0.02). There was a dose-response relationship between duration of whirlpool exposure and both disease (*P*=0.001) and IgM seropositivity (*P*=0.007).
Conclusions: This outbreak highlights the need for travel-related legionellosis surveillance in the United States to determine magnitude of the problem and to allow for prompt intervention. Molecular subtyping and IgM testing were critical adjuncts to the epidemiology of this investigation and will prove useful in rapid identification of legionellosis outbreaks.

Laboratory Surveillance

P4. ***David S. Blythe, B. Robison, J. Roche, C. Groves***
Survey of Legionnaires' Disease Detection Practices at Maryland Hospitals

Background: Nosocomial Legionnaires' disease (LD) accounts for up to 14% of all nosocomial pneumonias, but many hospitals, including those routinely performing environmental *Legionella* testing, may not have the capacity to adequately identify such cases. Following a nosocomial LD outbreak in Maryland, we surveyed Maryland health-care facilities to evaluate current LD detection practices.
Methods: A two-page questionnaire was mailed to infection-control practitioners (ICPs) at all 92 hospitals licensed in Maryland. Anonymous information was collected on hospital size and patient characteristics, nosocomial pneumonia surveillance, and clinical and environmental *Legionella* testing practices.
Results: ICPs from 47 (51%) of 92 hospitals responded to the survey. Twenty (43%) of the responding hospitals had a capacity of >200 beds; 12 (26%) housed patients who had undergone solid organ or bone marrow transplantation. Although 45 (96%) performed routine surveillance for nosocomial pneumonias, only nine (19%) reported including *Legionella* testing routinely in the work-up of such cases. Only five (11%) had in-house capacity to perform *Legionella* cultures, and only eight (17%) performed *Legionella* urinary antigen testing. Of the responding hospitals, 19 (40%) conducted no routine environmental testing for *Legionella*, 14 (30%) routinely cultured cooling towers and potable hot water systems, 13 (28%) cultured cooling towers only, and one (2%) cultured potable hot water only. Of those hospitals that cultured potable water, only three performed urinary antigen testing and only one performed clinical *Legionella* cultures.
Conclusions: Most hospitals in Maryland do not have the capacity to adequately detect nosocomial LD cases. *Legionella* urinary antigen and in-house culture testing should be available at Maryland hospitals and performed for all nosocomial pneumonia cases, particularly at hospitals that conduct routine environmental testing.

P5. ***Joseph F. Perz, A. Craig, D. Jorgensen, S. Hall, W. Schaffner***
Effective Alternate Surveillance System for Drug-resistant *Streptococcus Pneumoniae*

Background: Effective, affordable surveillance strategies are needed at the local level to monitor drug-resistant *Streptococcus pneumoniae* (DRSP), to guide empiric therapies and monitor changes. Knox County, Tennessee, participates in both active CDC-sponsored and enhanced passive local DRSP surveillance, affording an opportunity to measure a simple surveillance strategy against a recognized "gold standard."
Methods: Completeness of reporting within the two systems was evaluated for invasive *Streptococcus pneumoniae* infections occurring in Knox County residents in 1998. Drug-resistance patterns, costs, and other system attributes were compared.

Results: Both systems use hospital laboratories as the source of case reports. The local system collects patient identifiers and drug susceptibility data directly from the laboratories, whereas the CDC-sponsored system performs medical chart abstractions and reference laboratory susceptibility testing. The local system detected more total cases (n = 127) than the CDC-sponsored system (n = 123). The two systems held over 75% of the total cases in common, and each system achieved greater than 80% sensitivity. The proportion of isolates that were characterized as penicillin nonsusceptible was lower in the local system than in the CDC-sponsored system (45% versus 55%) but this difference was not statistically significant. Approximate annual expenses were lower for the local system ($3,000 versus $30,000). The average time to complete reporting was 1 month for the local system versus 4 months for the CDC-sponsored system.

Conclusions: The local DRSP surveillance system performs well relative to the CDC-sponsored system. Although the local system's scope is more modest, it is more timely and responsive to local needs. It uses resources efficiently and might serve as a model for other communities.

P6. ***Sonja J. Olsen, R. Bishop, F. Brenner, T. Roels, R. Tauxe, L. Slutsker***

Trends in *Salmonella* Serotypes Isolated from Humans in the United States, 1987–1997

Background: Salmonellosis is a major cause of foodborne illness in the United States, resulting in an estimated 1.4 million infections and 600 deaths annually. In 1962, CDC and state health departments implemented laboratory-based *Salmonella* surveillance to define endemic patterns of salmonellosis, identify trends in disease transmission, and monitor control efforts. We examined trends over the 11-year period, 1987 to 1997.

Methods: All state public health laboratories are requested to report serotypes of *Salmonella* to CDC. Information on patient gender, age, ethnicity, race, and county and state of residence, as well as specimen source and serotype are included. We calculated annual isolation rates using census data.

Results: Between 1987 and 1997, CDC received reports on 441,863 *Salmonella* isolates. *Salmonella* annual isolation rates decreased from 19/100,000 persons in 1987 to 13 in 1997. The isolation rate of egg-associated *S.* serotype Enteritidis peaked at 3.6/100,000 persons in 1996 and then decreased. Recent declines were also noted in serotypes associated with poultry and swine. The highest age-specific isolation rate was among infants, peaking at 159/100,000 infants 2 months of age. Serotypes that increased in frequency over the study period were significantly more likely than those that decreased to be reptile associated (p=0.008).

Conclusions: *Salmonella* infections continue to be an important cause of morbidity and mortality in the United States, especially among infants. Recent declines in *S.* serotype Enteritidis and other food-associated serotypes may reflect changes in the meat, poultry and egg industry that preceeded the 1996 implementation of pathogen reduction programs. Risk factors for infant salmonellosis need to be identified to improve prevention. Additional educational efforts are needed to control the emergence of reptiles-associated salmonellosis.

P7. ***Virginia R. Roth, M. Kuehnert, S. Holt, M. Arduino, R. Haley, K. Gregory, L. Carson, G. Schreiber, W. Jarvis***

Adverse Events Due to Bacterial Contamination of Blood and Blood Products in the United States (The BaCon Study)

Background: The safety of the U.S. blood supply is of great public health concern. However, the risk of transfusion-transmitted bacterial infection and the fatality rate from bacterially contaminated blood products are unknown.

Methods: In this ongoing study, hospitals nationwide report transfusion reactions meeting clinical criteria. Clinical and transfusion data are recorded and cultures obtained from blood product and recipient. Organisms

recovered undergo molecular typing using pulsed-field gel electrophoresis (PFGE). If the organisms from the blood product and recipient are indistinguishable by PFGE, the event is considered a case of transfusion-associated bacteremia.

Results: During the first 18 months, 13 reports of transfusion-associated bacteremia were confirmed; 4 (31%) were fatal. Clinical findings most commonly reported were rigors (13/13) or fever (10/11). Six platelet pheresis units (1 in 131,537), 5 platelet pools (1 in 111,456), and 2 red blood cell units (1 in 5,830,431) were involved. The product was leukoreduced in 6 instances and irradiated in 3. Organisms implicated were staphylococci (6), streptococci (3), *Enterobacter* spp. (2), *Escherichia coli* (1), or *Serratia liquefaciens* (1). Fatalities were associated with gram-negative vs. gram-positive organisms (3/4 vs. 1/9; $p<0.05$) and with units discolored at time of transfusion vs. visually normal units (2/2 vs. 2/9; $p<0.05$). Longer delay in antibiotic treatment was noted in fatal vs. nonfatal cases (median delay 240 vs. 119 minutes after symptom onset), although this difference was not statistically significant.

Conclusions: Bacterial contamination is an important cause of transfusion reaction, and is more frequently reported with platelets. Events are probably underreported. The fatality rate is high, particularly with gram-negative organisms. Pre-transfusion inspection for abnormal unit appearance and rapid recognition and treatment of transfusion-associated sepsis may avert some fatalities.

Vector-borne Diseases

P8. ***Farzad Mostashari, M. Eidson, N. Jeffrey, M. Merlino, L. Farhang, T. McNamara, N. Komar, R. Lanciotti, A. Kerst, A. Panella, W. Stone, M. Jung, D. Nash, A. Fine, M. Layton***
Bird Mortality as a Public Health Surveillance Tool, West Nile Virus Outbreak — New York City, 1999

Background: The epidemic of West Nile Virus (WNV) in New York during the summer of 1999 was accompanied by an epizootic among bird that caused widespread bird mortality— an unprecedented aspect of this flavivirus outbreak. Active surveillance for bird deaths was proposed as a way to monitor the spread of the virus.

Methods: We compared the timing of bird deaths to the onset of human cases of disease using multiple sources of historic data, including pre existing passive surveillance for unusual bird deaths. Beginning in late September, we instituted active surveillance for bird deaths using the city's emergency encephalitis hotline. Dead birds were collected, necropsied, and tested for WNV. Testing was prioritized for birds with pathologic findings and for birds from areas without known human cases. The locations of reported bird deaths and WNV-positive birds were mapped.

Results: High numbers of dead or dying crows with disorientation and ataxia were documented in the epicenter of the human outbreak several weeks before the earliest human cases. Necropsied crows from this area were later found to have had WNV encephalitis. Under active surveillance, we documented 3,000 calls regarding dead birds, attempted 462 pickups, and collected 134 specimens. Of 32 crows tested, 28 (88%) were positive for WNV, compared with 0 (0%) of 6 birds of other species. Human and mosquito surveillance was intensified in areas with crow deaths or documented WNV-positive birds.

Conclusions: In naïve populations, bird deaths can precede a human WNV outbreak. Surveillance for bird deaths, particularly among crows, can help detect the spread of WNV to new areas, and could guide human and mosquito surveillance.

P9. ***John A. Painter, T. Farley***
Usefulness and Cost of Sentinel Surveillance for Eastern Equine Encephalitis — Louisiana, 1999

Background: Eastern Equine Encephalitis (EEE) is an uncommon but severe disease transmitted by mosquitoes. The Louisiana Office of Public Health recommends mosquito abatement in areas of EEE activity, but optimal sentinel surveillance methods are unknown.
Methods: We evaluated the cost and usefulness of three different sentinel surveillance data sources in predicting human cases of EEE in 1999. These data came from horse sera, bird sera, and pooled mosquitoes collected during May – November.
Results: Two human cases of EEE were reported from two health regions in Louisiana during the 6-month period. During the same period, 95 equine EEE cases were reported but only fifteen (0.5%) of 2,991 mosquito pools and eleven (0.2%) of 6,179 bird sera tested positive. Each human case was preceded by multiple equine cases in the same regions in the preceding 4 weeks, and each was accompanied by equine cases in the same parish in the same week. Human cases were not preceded by test-positive birds. One human case was preceded by 7 weeks by a positive mosquito pool in the same region, but not in the same parish. Equine cases were reported from 33 (52%) of 64 parishes, but the bird and mosquito samples were collected from only ten (15.6%) parishes. The testing cost for horses was $3,427; for birds, $128,864; and for mosquitoes, $62,195.
Conclusions: Using birds and mosquitoes to conduct surveillance for EEE was costly and not useful in predicting disease. Equine surveillance represented a larger area of the state, identified cases that preceded human cases, and was less costly. Surveillance and response for EEE should be based on identifying equine cases at a regional level.

P10. ***Tejpratap S.P. Tiwari, J. Rawlings, E. Svenkerud, K. Hendricks***
Surveillance for Dengue Fever — Laredo, Texas, 1999

Background: During July 1999, approximately 300 cases of dengue fever were reported from Nuevo Laredo, Mexico. No cases were reported in the adjacent city of Laredo, Texas despite the presence of the mosquito vector on both sides of the border and an estimated two million border crossings per month between the two cities. We conducted enhanced surveillance to determine whether a diagnosis of dengue fever was being missed by Laredo physicians.
Methods: From July 23 to August 20, 1999, we reviewed medical records for two hospital emergency rooms and three community health clinics in Laredo. We identified patients aged $\geq$5 years who had either a fever with rash of any duration or a febrile illness >2 days duration without cough or diarrhea. Blood samples from possible case-patients were sent for dengue IgM and IgG antibody testing.
Results: Twenty-five (51%) of 49 patients who met the case definition for suspected dengue could not be located. Two (4%) patients refused to give blood. Dengue antibodies were found in 12 (55%) of 22 patients who were tested. Ten (83%) of these 12 patients had IgM antibodies indicating recent infection. Eight (80%) of the IgM-positive patients had a diagnosis of non-specific fever or viral illness. No patient was hospitalized and all made uneventful recoveries. Eight (80%) of the IgM-positive patients had traveled to Mexico within 2 weeks of onset of illness.
Conclusions: Patients with dengue fever who were examined at emergency rooms or clinics in Laredo were misdiagnosed. On the Texas-Mexico border, a diagnosis of dengue fever should be considered in febrile patients with no evidence of other systemic illness.

P11. ***Daniel R. O'Leary, J. Rigau, V. Vorndam, E. Hayes, G. Clark, D. Gubler***
Dengue Surveillance in Relief Workers in Puerto Rico Following Hurricane Georges, 1998

Background: Information on health risks associated with disaster relief is important to the safe deployment of workers. In September 1998, Hurricane Georges struck Puerto Rico (PR), concurrent with the largest dengue epidemic there since 1994. We assessed the dengue risk in workers sent from the United States to restore electric services.

Methods: All workers from two power consortia from Connecticut and New York who worked in PR from Oct. 8 to Nov. 6 were asked to participate. On departure, they documented their activities and any illness experienced while in PR. Blood samples were obtained from 153 participants and tested for evidence of dengue infection. Data on any illness experienced in the 2 weeks following their departure were collected by mail or telephone.

Results: Of 222 workers contacted, 204 (91.9%) participated. Their mean length of stay in PR was 16 days. Of those responding to the following items, 82.4% (164/199) reported mosquito bites, 96.9% (156/161) reported having insect repellent available, and 71.8% (140/195) reported using repellent. Sera collected on departure were negative for anti-dengue IgM and IgG antibodies. Twelve participants reported dengue-like illness; four had onset while in PR, and eight had onset within 2 weeks after leaving PR. Follow-up specimens were obtained from 11 of these participants; all were negative for anti-dengue antibodies.

Conclusions: The incidence of dengue in these power company employees was low (point estimate 0 cases/1.6 person-years of exposure; upper 95% confidence interval 3 cases/1.6 person-years exposure). Use of protective measures may have contributed to this low incidence. Disaster relief workers in tropical areas should be encouraged to protect themselves against mosquito bites to minimize their risk of acquiring dengue.

P12. ***Julie M. Magri, T. Herring, M. Johnson, J. Greenblatt***
Physicians' Knowledge, Attitudes, and Practices Regarding Lyme Disease — New Hampshire, 1999

Background: Lyme disease (LD) is the most common vectorborne disease in the United States, and is endemic in several counties in the Northeast. In New Hampshire (NH), LD endemicity is not well characterized, though NH borders on high-risk areas in neighboring states and NH physicians have reported LD cases in NH residents. To help characterize physician approaches to LD diagnosis and treatment in NH, we studied NH physicians' knowledge, attitudes, and practices (KAP) regarding LD.

Methods: During 1999, we mailed a 21-question KAP survey to randomly selected NH family practitioners, internists, and pediatricians.

Results: Of 600 physicians in the sample, 330 (55%) responded. Respondents diagnosed LD in 241 patients during 1998, compared with 120 case reports received at the state health department during 1998. Respondents answered a median of 10 of 13 knowledge questions correctly, with no difference by specialty. In case scenarios, 86% of physicians would treat for LD on the basis of erythema migrans alone and 87% would not prescribe prophylactic antibiotics after tick bite. Almost half of physicians treated patients for possible LD solely because of patient concern, although pediatricians were less likely to do so. Physician belief in endemicity varied by region, from 7% of physicians in northern NH to 47% in southeastern NH. Those who thought LD endemic diagnosed more patients with LD than other physicians.

Conclusions: NH physicians had fairly good knowledge about LD and most managed case scenarios appropriately. However, many treated without objective evidence of LD, leading to potential overdiagnosis and overtreatment; many did not report diagnosed cases. LD may be more common in NH than previously thought. Better reporting will improve characterization of regional endemicity.

P13. ***Jennifer H. McQuiston, R. Holman, A. Groom, S. Kauffman, J. Cheek, J. Childs***
Assessing Risk for Rocky Mountain Spotted Fever Among Oklahoma American Indians

Background: Rocky Mountain spotted fever (RMSF) is the most commonly fatal tick-borne disease in the United States, with a mortality rate of 2–10%. Although Oklahoma accounts for over 10% of reported RMSF cases in the United States, the incidence of RMSF in the Oklahoma American Indian population has not been evaluated. A rural lifestyle may place American Indians at increased risk for tick bites.

Methods: RMSF cases from two reporting systems were examined. A retrospective analysis of an Indian Health Service (IHS) hospital discharge database was conducted to examine RMSF hospitalizations from 1980 through 1996, and available medical charts from four hospitals were reviewed. Case report forms (CRFs) for RMSF submitted to CDC from 1981 through 1996 were also examined.

Results: Preliminary analysis of the IHS database indicated that Oklahoma American Indians were hospitalized for RMSF at an annual rate of 48.2 per million population, compared with 16.9 for Oklahoma. However, medical chart review found that only 31% of IHS cases met the national definition for confirmed or probable RMSF. The incidence of RMSF for Oklahoma American Indians reported by CRFs was 37.4 cases per million, compared with 21.6 for Oklahoma (RR 1.7, 95% CI 1.5–2.1).

Conclusions: Although the rate of RMSF hospitalizations determined from the IHS database was overestimated and could not be reliably compared with national rates, analysis of CRFs confirmed that Oklahoma American Indians have a significantly higher incidence of RMSF than the overall Oklahoma population. This study indicates a need for physician education on the appropriate diagnosis of tick-borne illness. In addition, Oklahoma American Indians may benefit from educational campaigns emphasizing prevention of tick bites and exposure to tick habitats.

Vaccine Preventable Diseases

P14. ***Stephanie R. Bialek, D. Thoroughman, B. Bell***
Trends in Hepatitis A Incidence Among American Indians, 1990–1999

Background: Historically, the highest hepatitis A rates in the United States have occurred in American Indian (AI) communities, where infection is endemic and periodic community-wide outbreaks occur. In 1996, the Advisory Committee on Immunization Practices recommended routine hepatitis A vaccination for AI children, but the extent to which this recommendation has been implemented is unclear. To evaluate the impact of routine vaccination, we analyzed trends in hepatitis A incidence among AIs.

Methods: We calculated annual hepatitis A incidence rates during 1990–1999 by using data from the National Notifiable Diseases Surveillance System and population estimates from the Census Bureau.

Results: During 1990–1995, annual hepatitis A incidence among AIs ranged from 60 to 100/100,000, compared with a yearly average U.S. rate of 10/100,000. By 1999, the incidence among AIs declined to 6/100,000, approaching the U.S. rate of 4/100,000. Among AIs living in rural counties on the 10 most populous reservations (52% of all AIs living on reservations), hepatitis A incidence declined from 537/100,000 in 1994 to 2/100,000 in 1999, lower than the incidence for non-AIs in these counties (8/100,000). Hepatitis A rates among AIs living in six urban counties with large AI populations peaked at 202/100,000 in 1992, eleven times higher than the rate among non-AI's in these counties. In 1999, the hepatitis A rate among AIs in these counties had decreased to 21/100,000, but remained above that for non-AI's (8/100,000).

Conclusion: Since 1995, hepatitis A incidence among both rural and urban AIs has declined dramatically. This decline may be related to routine hepatitis A vaccination of AI children. Because of the periodicity of community-wide epidemics of hepatitis A, continued surveillance is needed to confirm this finding.

P15. ***Timothy H. Holtz, M. Kolczak, D. Terlouw, F. Ter Kuile, P. Phillips-Howard, S. Kachur, A. Kwena, A. Oloo, R. Helfand, B. Nahlen***
Missed Opportunities for Immunization in Western Kenya

Background: Vaccine-preventable illnesses account for significant morbidity and mortality in children living in western Kenya. Both measles and polio are the focus of intense national and international elimination/eradication efforts. In Kenya, Kick Out Polio campaigns have occurred annually in recent years. Identifying missed opportunities for vaccination is a potentially important component of efforts to increase vaccination coverage.

Methods: Three independent cross-sectional surveys were performed in 65 communities of western Kenya's Bondo District between January 1998 and July 1999 as part of a malaria intervention project. Households with children under 5 were selected by simple random sampling. Using vaccine cards and history, data were collected on vaccination coverage, recent medical visits, and recent illnesses.

Results: Among 825 children ages 12 to 23 months, full routine polio (4 doses) and DPT (3 doses) coverage was 70.1%, and measles coverage was 52.5%. Kick Out Polio campaigns raised full polio coverage to 71.8%. Only 50.5% of children ages 12-to-23 months had the full set of recommended vaccinations. Twenty-nine percent of children with incomplete vaccinations had seen a formal health care provider two weeks prior to the interview.

Conclusions: Vaccine coverage rates for measles and polio in Bondo District lag far behind goals set by the Kenyan government. Among children 12 to 23 months old, Kick Out Polio campaigns did little to improve coverage. Remaining gaps could be addressed if health care providers took advantage of opportunities for immunization that are currently being missed. Emphasis should be placed on checking vaccination coverage for all children presenting to community health workers, health clinics, hospitals, and private providers.

Monday Afternoon — April 10, 2000

1:30 Tuberculosis. Moderator: Nancy J. Binkin

1:35 *Lisa K. Fitzpatrick, T. Agerton, R. Ridzon, J. Hardacker, I. Onorato*
Tuberculosis in a Small Community: A Preventable Outbreak

Background: In 1998, Michigan City, Indiana (population 33,000) reported 19 TB cases, a 4-fold increase from 1996. An investigation to assess the increase in cases and identify possible epidemiologic links among cases was conducted.

Methods: Cases and contacts were interviewed and medical and laboratory records were reviewed. Contact tracing, preventive therapy records and TB skin test logs were examined.

Results: Forty one cases (5 in 1996, 9 in 1997, 19 in 1998, 8 in 1999) were identified. Of the 41 cases, 31(76%) had epidemiologic links identified during the current investigation and/or had isolates with matching DNA fingerprints (outbreak-related cases). Twenty-eight of the 31 cases (90%) were black, 24 (77%) were male, median age was 39 years (range 1–78) and 28 (76%) were HIV negative. TB control activities were limited before 1997. Consequently, only 5 (16%) of 31 outbreak-related cases had been identified as contacts to a TB case; all were household contacts; three were <4 years of age. At least 24 of the 31 cases may have been preventable; 6 had contact with a 1991 case (the presumed source case) and 18 were contacts to later cases but none were identified as contacts until the current investigation. Of 445 contacts identified, 315 (75 %) were screened; 84 (27%) had positive TB skin tests. Of these, 52 (62%) received preventive therapy.

Conclusions: This outbreak could have been prevented with prompt case identification and effective contact tracing and screening. Twenty-four cases may have been prevented if preventive therapy was initiated when they had contact to a previous case. This outbreak illustrates that TB control measures should be maintained in areas with historically low TB incidence.

1:55 ***Jennifer A. Giroux, G. Hosey, B. Skipper, R. Paisano, T. Welty, K. Acton, R. Bryan, J. Cheek***
Evaluation of Tuberculosis Prevention Among American Indian and Alaska Native Persons with Diabetes

Background: American Indians and Alaska Natives are currently experiencing an epidemic of type 2 diabetes. Persons with diabetes have a three to five fold greater risk for progression to active tuberculosis (TB) than persons without diabetes. Indian Health Service (IHS) guidelines recommend that people with diabetes be targeted for TB testing with Purified Protein Derivative (PPD). If positive and not previously treated, persons should receive therapy to prevent progression to active TB. The IHS Diabetes Program performs an audit of a representative sample of patient records to monitor clinical care of persons with diabetes.
Methods: We used the 1995–98 Diabetes Audits to evaluate target testing and treatment of latent TB infections. We evaluated trends over time and geographical differences by IHS service areas. Persons were assigned to one of four categories: uninfected (PPD negative); treated infection (PPD positive and treated); untreated infection (PPD positive and untreated); and untested (PPD status unknown).
Results: Nationally, the proportion of untested persons showed no decline over the 4-year period (range: 36%–38%), neither did the proportion of patients with untreated infection decline (range: 16%–19%). In 1998, 11,581 of 70,751 (16%) diabetic patient charts were audited. Of these, 4,400 (38%) persons were untested and 1,853 (16%) were untreated for latent TB infection. Geographical variation in the untested group ranged from 22% to 64%, and 7% to 28% in the untreated group.
Conclusion: Improved target testing and treatment of latent TB infection could reduce TB morbidity and mortality among American Indian and Alaska Native persons with diabetes.

2:15 ***Peter D. McElroy, R. Ridzon, T. Sterling, D. Thompson, R. Stanley, A. Madison, S. Bur, J. Crawford, I. Onorato***
***M. Tuberculosis* Transmission Among Transgenders — Baltimore, June 1998–December 1999**

Background: In mid-1998, four cases of tuberculosis (TB) were recognized among young African-American men; three had HIV infection. DNA fingerprint analysis of all four *M. tuberculosis* isolates showed a matching 11-band pattern, demonstrating the cluster resulted from a common strain. These results prompted further interview of the case-patients to identify contacts and risk factors for transmission.
Methods: Case-patients were reluctant to identify contacts. Therefore a high-risk profile was developed to identify additional persons for TB screening, including a tuberculin skin test (TST). The profile included male cross-dressers (transvestites) and membership in various "houses" (social networks of young gay African-American males, including transvestites). DNA fingerprinting was performed on *M. tuberculosis* isolates from all subsequent TB patients.
Results: Twenty TB case-patients have been identified in this cluster. All 17 available *M. tuberculosis* isolates had a matching DNA fingerprint. All but one patient was African-American and 16 were male. Median age was 24 years and 12 (60%) were HIV-positive. Among the males, 13 (81%) were gay or transvestite and 12 (75%) reported membership in a "house." Of 105 persons meeting the high-risk profile, 96 (91%) had a TST placed, 65 (68%) were read, 24 (37%) were positive, and five TB case-patients were identified. HIV infection was detected in 14 (30%) of 47 contacts tested.
Conclusions: A TB outbreak comprised mostly of young gay African-American male transvestites was identified. The high prevalence of HIV infection in this social network increased the risk of TB. The DNA fingerprints confirmed suspicions that the early case-patients were linked and prompted early investigation of this social network, revealing extensive *M. tuberculosis* transmission within this unique group.

2:35 ***Steven I. McLaughlin, P. Spradling, D. Drociuk, R. Ridzon, C. Pozsik***

Transmission of *Mycobacterium Tuberculosis* Among Prison Inmates Infected with Human Immunodeficiency Virus — South Carolina, 1999

Background: In adults with *Mycobacterium tuberculosis* infection, the strongest known risk factor for development of active tuberculosis is human immunodeficiency virus (HIV) infection. Prison inmates who develop active tuberculosis can transmit disease to other inmates, staff, and into the communities where they are released. In August 1999, an inmate from a prison dormitory (Dormitory A) for 238 HIV-positive men was diagnosed with infectious pulmonary tuberculosis.

Methods: We interviewed case-patients and reviewed medical records. Case-patients were culture-positive for *M. tuberculosis* or had a positive tuberculin skin test (TST), abnormal radiograph, and clinical evidence of disease since August 1, 1999. We compared the DNA fingerprints of isolates. Skin testing of TST-negative inmates was conducted in September 1999 with follow-up testing in December 1999. TSTs $\geq$5 mm were considered positive. We documented viral loads and CD4+ counts for inmates in Dormitory A.

Results: We identified 23 inmates with active tuberculosis; all lived in Dormitory A. Twenty (87%) of 23 case-patients resided in the right wing of Dormitory A (DAR). Isolates were sensitive to all drugs tested; all eight isolates tested to date had matching DNA fingerprint patterns. Overall, 74/95 (78%) inmates from DAR and 31/341 (9%) of all other HIV-positive inmates converted to positive TSTs (Relative Risk [RR]=8.6; 95% Confidence Interval [CI]= 6.0–12.2). In DAR, case-patients were more likely to have CD4+ counts <200 compared to TST convertors (RR=2.4; CI=1.1–5.4). Increasing viral loads were also associated with development of active tuberculosis (Chi-square test for trend=4.3; p=0.04).

Conclusions: We documented extensive transmission of *M. tuberculosis* among HIV-infected inmates. Incarcerated populations, especially those infected with HIV, require appropriate screening, diagnosis and treatment for *M. tuberculosis*.

2:55 ***Elizabeth A. Talbot, T. Kenyon, M. Mwasekaga, T. Moeti, V. Mallon, N. Binkin***
Control of Antituberculosis Drug Resistance — Botswana, 1999

Background: Approximately 25% of adults in Botswana are infected with HIV. This high prevalence contributed to the 1998 tuberculosis (TB) rate of 521/100,000, which represents a 158% increase since 1989, and is one of the highest rates in the world. However, a 1995–1996 survey demonstrated low antituberculosis drug resistance, which was attributed to adherence to the World Health Organization's recommended TB control strategy. Because TB drug resistance may increase rapidly in HIV-infected populations, a second survey was undertaken in 1999.

Methods: Sputum specimens positive for acid-fast bacilli from patients without prior TB (new patients), and all sputum specimens from patients reporting prior TB (retreatment patients) were collected nationwide from January – May 1999. Specimens were cultured for *Mycobacterium tuberculosis* and tested for resistance to isoniazid, rifampicin, ethambutol, and streptomycin using the resistance ratio method and/or a liquid media system.

Results. Of 783 patients enrolled, 483 (61.7%) were male, the median age was 33 years, and 84% were new patients. Drug resistance occurred in 6.3% of new patients (95% confidence interval [CI]=4.6–8.6) and 22.8% of retreatment patients (95% CI=16.5–30.1), compared with 3.7% (95% CI=2.2–5.8) and 14.9% (95% CI=9.3–22.1), respectively, in 1995–96. Resistance to at least isoniazid and rifampicin was found in 0.5% of new (95% CI=0.1–1.3) and 9.0% of retreatment patients (95% CI=5.1–14.5), compared with 0.2% (95% CI=0–1.1) and 5.8% (95% CI=2.6–11.1), respectively, in 1995–96.

Conclusions. Despite the rapid increase in TB cases and HIV prevalence, antituberculosis drug resistance has not increased significantly in Botswana. These findings suggest that an adequate TB control program can prevent the emergence of drug resistant TB even during severe TB and HIV co-epidemics.

3:35 From Behavior to Condition. Moderator: Alexander E. Crosby

3:40 *Eileen F. Dunne, M. Evans, K. Fogerty, A. Markham, B. Cheney, F. Brown, S. Zaki, W. Shieh, J. Wells, C. Hahn, D. Swerdlow*

Increase in Appendectomies in Southeastern Idaho — Mass Sociogenic Illness?

Background: Mass sociogenic illness typically occurs among adolescent girls and results in costly epidemiologic and laboratory evaluations. In May 1999, we investigated an increase in appendectomies in Montpelier, Idaho, due in part to sociogenic factors.

Methods: We evaluated medical records and pathology reports for appendectomy patients in Montpelier from March –June, 1999. To determine influences on patient's decision to seek medical care, we conducted a case-control study. Case-patients were Montpelier appendectomy patients and controls were community members with abdominal pain who did not seek medical care. Surgical and stool specimens from appendectomy patients were evaluated for bacterial, viral and parasitic pathogens.

Results: Fifty-six appendectomies were performed from March 1–June 15, 1999, compared with 7 performed during the same time period the previous year. The median age of patients was 14 years; 86% were female. No changes in physician practices or diagnostic procedures were identified. Forty-three (84%) appendices had no acute inflammation by pathology report and were considered negative for appendicitis. In the case-control study, case-patients were more likely to have thought they had appendicitis (odds ratio [OR] 7.5, p=.004) and to have known someone with an appendectomy (OR 9.8, p=.05), factors that may have increased the likelihood of patients seeking care and thus having an appendectomy performed. Laboratory evaluations of all clinical specimens were negative; the cluster ended with the conclusion of the school year.

Conclusion: Patient demographics, negative pathology and laboratory findings, and case-control study results suggest this increase in appendectomies was due in part to sociogenic factors, the first time this has been described. We recommended that health care providers institute standard evaluation criteria for appendicitis to prevent unnecessary surgeries.

4:00 *Elizabeth H. Crane, M. Thompson, J. Guerrero*

Dating Violence and Adolescent Suicidal Ideation and Attempts

Background: Suicide is the third leading cause of death for U.S. adolescents. Intimate partner abuse is a risk factor for suicide attempts among adult women, but this relationship has not been investigated for adolescents.

Methods: We used data from a nationally representative sample of U.S. middle and high school students interviewed in 1996 to assess whether prior abuse (being threatened or verbally or physically abused) in dating relationships was a risk factor for suicidal ideation or attempt. Our sample included 2990 students aged 12–19 who reported a romantic relationship or romantic behavior in the past 18 months. Thirteen percent reported suicidal ideation and 5% reported a suicide attempt in the past year. Although 30% of students reported partner abuse, only respondents whose first incident of abuse occurred at least a year before the interview (6%) were considered previously exposed to abuse. We calculated adjusted odds ratios (AORs) with logistic regression, controlling for age, race, sex and previous suicidal behavior. Because we found a significant interaction between sex and partner abuse for suicide attempts, we then stratified our analyses by sex.

Results: Boys who reported prior partner abuse were over four times more likely to report making a suicide attempt than than boys who did not report prior partner abuse (AOR 4.35; 95% CI 1.33–14.28); however, those who reported abuse were not significantly more likely to report suicidal ideation than those who did not report abuse. No significant associations were found for girls.

Conclusions: For boys, abuse by a dating partner appears to be a risk factor for suicide attempts. Adolescent suicide prevention programs should address partner abuse as a potential risk factor for suicidal behavior.

4:20 ***Douglas M. Frye, D. Broudy, R. Voorhees, S. Castle, R. Zumwalt, C. M. Sewell***
Suicide in New Mexico Youth, 1980–1996

Background: Historically, the rate of suicide among New Mexico youth has been twice the national rate. Our objectives were to describe youth suicide in New Mexico during 1980–96, and to identify groups with potentially preventable risk factors.

Methods: We did a retrospective cohort study of suicide in New Mexico youth (age < 25 years) by using data from the Office of the Medical Investigator (OMI). Risk variables among "school-aged youth" (age 9–18 years) are compared with "older youth" (age 19–24 years).

Results: During 1980–1996, 1079 deaths by suicide were reported among New Mexico youth, aged 9–24 years, in the OMI database. Of these, 386 (34%) were school-aged and 968 (85%) were male. Race/Ethnic-specific rates (in deaths per 100,000 population) were: Hispanic, 19.1; White, 18.3; and Native American, 19.4. Firearms were involved in 738 (68%) and alcohol was present at autopsy in 515 (45%). School-aged youth were less likely than older youth to have alcohol present on autopsy (Relative Risk [RR]=0.55; 95% Confidence Interval [CI]=0.46, 0.65) and were more likely, on weekdays during school months, to complete suicide between 3–5 p.m. (RR=5.4; 95% CI=2.1, 13.8). School-aged youth completing suicide at these times were less likely to have alcohol present at autopsy (0/18) than school-aged youth completing suicide at other times (14/63; p=0.03), but were as likely to use firearms (67%) as the rest of the cohort.

Conclusions: Youth suicide in New Mexico during this period were predominantly among males, with similar rates among the state's three major race/ethnic groups. Our results suggest that school-aged youth may be at risk for suicide during after-school hours and that suicides in this "after school" group are less likely to be alcohol-related.

4:40 ***Amy D. Sullivan, K. Hedberg, D. Fleming***
Reasons for Seeking Legal Physician-Assisted Suicide — Oregon, 1999

Background: Oregon's status as the only state allowing legal physician-assisted suicide (PAS) provides a unique opportunity to assess PAS utilization. Physicians of the 16 terminally ill patients using PAS in 1998 reported patient concerns over loss of autonomy and control of bodily functions, not pain or financial problems. In 1999, we interviewed family members of patients to further characterize motivations for requesting PAS.
Methods: Patients participating in legal PAS were identified through required physician reporting. Using death certificate data, we compared patients participating in 1999 with those in1998 and to Oregonians dying of similar illnesses. To evaluate patient motivations, we interviewed all physicians, and families of patients who participated in PAS between September 15, 1998 and October 15, 1999.
Results: The 24 patients (7.9 /10,000 deaths) using legal PAS in 1999 were similar to the 16 in 1998; and were comparable to other deceased Oregonians, though more likely college educated (Relative Risk=10.3, 95% Confidence Interval=3.1–34.5). Eighteen (75%) of the 24 patients were in hospice. Multiple concerns motivated patient PAS requests. Similar to physicians, most of the 18 family members interviewed included concerns about losing autonomy (67%) and control of bodily functions (72%). Families of 10 (56%) patients mentioned concern about physical suffering; six of these patients were reportedly experiencing pain, dyspnea or a trapped feeling due to amyotrophy when they requested PAS.
Conclusions: As in 1998, small numbers of patients used legalized PAS in 1999. Not all physical suffering appeared to be controllable with medication. Patients requested PAS because of concerns about losing autonomy, losing control of bodily functions and physical suffering.

Tuesday Morning — April 11, 2000

8:30 Foodborne Diseases. Moderator: Robert V. Tauxe

8:35 ***Mamadou O. Diallo, K. Bradley, L. Smithee, A. Lee, J. White, M. Grubbs, R. Moolenaar, M. Crutcher***
An Outbreak of *Escherichia Coli* O157:H7 Linked to Unpasteurized Apple Cider — Oklahoma

Background: *E. coli* O157:H7 is estimated to cause about 73,000 infections each year in the United States. In children aged < 5 years, illness may be complicated by hemolytic uremic syndrome (HUS) or even death. We investigated an *E. coli* O157:H7 outbreak in Oklahoma during October 1999.
Methods: To identify the risk factors for illness, we conducted a case-control study. A case was defined as diarrheal illness ($\geq$3 stools/24 hours) occurring in a northeast Oklahoma resident during October 1999, and a positive stool antigen test or culture for *E. coli O157:H7*. For each case, two or three acquaintance controls were selected, matched by age and geographic area. They were asked about clinical symptoms and risk factors for illness. Pulsed-field gel electrophoresis (PFGE) was performed on available stool isolates. Cider and production site samples were cultured.
Results: Eleven cases of *E. coli* O157:H7 infection were identified. Patients' median age was 10 years (range: 2–38 years), seven (64%) were female, six (55%) were hospitalized, and three (27%) developed HUS. All nine isolates had the same PFGE pattern. Ten (91%) of 11 patients and none of the 24 controls drank unpasteurized brand A apple cider. Brand A cider was the only factor associated with infection (matched odds ratio indeterminate; p<.00001). Cultures from the cider and production site were all negative for *E. coli* O157:H7.
Conclusion: An *E. coli* O157:H7 outbreak was linked to consumption of unpasteurized apple cider in Oklahoma. Despite increasing food safety standards, unpasteurized apple beverages continue to pose a risk for

foodborne illness caused by *E. coli* O157:H7. To prevent further outbreaks, commercial fruit beverages should be pasteurized.

8:55 ***Josefa M. Rangel, M. Moll, S. Rossiter, P. Britz, D. Stadler, L. Iampietrow, J. Brooks, W. E. Keene, P. Mead***

Outbreak of *Escherichia Coli* O157:H7 Infections Linked to Romaine Lettuce in a Pennsylvania Retirement Community

Background: Each year *Escherichia coli* O157:H7 (O157) causes an estimated 73,000 illnesses in the United States. In November 1999, seven residents of a Pennsylvania retirement facility were hospitalized with O157 infection, two with life-threatening hemolytic-uremic syndrome.

Methods: To determine the source and magnitude of the outbreak, we surveyed facility residents and conducted a case-control study. We defined a case as diarrhea ($\geq$3 loose stools in a 24-hour period) with bloody stools or abdominal cramps. Randomly selected well residents served as controls. O157 isolates were subtyped by pulsed-field gel electrophoresis (PFGE).

Results: We surveyed 1753 residents and identified 40 cases; 9 were culture-confirmed. Median age of ill persons was 75 years; 83% were female. Illness was associated with eating romaine lettuce prepared in one of the facility's three kitchens (odds ratio 28.6; 95% confidence interval 3.5–625.1). The implicated lettuce was washed by soaking it briefly in water. Another kitchen in the facility received romaine during the same time period, but rinsed it in a colander. When compared with a national database, the PFGE pattern of isolates was indistinguishable from that associated with a recent O157 outbreak in Oregon linked to eating Caesar salad. These isolates also shared an unusual inability to metabolize lysine. Preliminary traceback results reveal that both facilities in Pennsylvania and Oregon received romaine lettuce from the same producer.

Conclusions: This multistate outbreak underscores the importance of lettuce as a vehicle for O157 infection and demonstrates the value of subtyping in uncovering an outbreak's extent. Our findings suggest the method of cleaning lettuce may affect risk of infection, and that further measures are needed to prevent contamination of lettuce in the field.

9:15 ***Louisa J. Castrodale, M. Beller, B. Chandler, R. Fankhauser, S. Jenkerson, L. Jaykus***

Outbreak of Norwalk-Like Virus Associated with Potato Salad — Anchorage, Alaska, 1999

Background: Norwalk-like virus (NLV) is the most common cause of foodborne illness in the United States, accounting for an estimated 67% of the almost 14 million cases of foodborne illness each year. In November 1999, we investigated a large gastroenteritis outbreak that occurred 2 days after a company held a restaurant-catered luncheon for 500 employees.

Methods: We e-mailed questionnaires to the company employees, interviewed food preparers, and inspected the restaurant. Because luncheon leftovers were served at the restaurant for four days following the luncheon, we contacted patrons identified from credit card receipts. A case of gastroenteritis was defined as nausea, vomiting or diarrhea occurring 1–72 hours after eating restaurant-prepared food. Stool and potato salad samples were tested for NLV using reverse transcriptase-polymerase chain reaction (RT-PCR).

Results: Of 456 employees who returned questionnaires, 191 (55.7%) of 343 luncheon attendees met the case definition. Case-patients were more likely than noncases to have eaten potato salad (183 (95.8%) of 191 versus 53 (34.9%) of 152; relative risk=10.4; 95% confidence interval=5.3–20.3). Eight (88.9%) of nine restaurant patrons who ate potato salad were ill. NLV was detected by RT-PCR in stools from 10 of 11 luncheon attendees, 2 of 2 restaurant patrons, and an ill food preparer who used bare hands to mix 12 gallons of potato salad. The RT-PCR products from one luncheon attendee, restaurant patron, and the implicated food handler had identical nucleotide sequences.

Conclusions: Potato salad, prepared by a food handler ill with NLV, caused at least 200 cases of gastroenteritis. Outbreaks such as this are preventable: ill workers should be excluded from food handling, and food preparers should minimize direct contact with ready-to-eat foods.

9:35 ***Eva S. Quiroz, C. Bern, J. MacArthur, L. Xiao, M. Fletcher, M. Arrowood, D. Shay, M. Levy, R. Glass, A. Lal***

An Outbreak of Cryptosporidiosis Linked to a Foodhandler

Background: In September 1998, a large cryptosporidiosis outbreak occurred on a Washington, D.C., university campus. This investigation is the first to use molecular and epidemiologic methods to link foodborne cryptosporidiosis with an infected foodhandler.

Methods: We conducted case-control studies using standardized questionnaires and computerized meal-record data, and screened stool specimens from students and cafeteria employees. Stool specimens were tested for *Cryptosporidium parvum* by enzyme immunoassay. *Cryptosporidium* oocysts were isolated by sucrose-cesium chloride gradient centrifugation followed by DNA extraction. *Cryptosporidium* parasites were genotyped by a small subunit rRNA-based polymerase chain reaction restriction fragment length polymorphism technique.

Results: Eighty-eight students and four employees had gastroenteritis from September 19 through October 15; the outbreak peaked September 28–29, when 62% of those affected had illness onset. Eating in Cafeteria A during the 2 weeks before the outbreak was strongly associated with illness and a pronounced dose-response relationship was demonstrated (x^2 for trend = 25, p <0.001). Among 85 patients and 63 controls, morbidity was most strongly associated with eating dinner on September 22 (odds ratio, 8.1; 95% confidence interval 3.4 – 19.5). *C. parvum* was detected in stool specimens of 16 (70%) of 23 ill students and two of four ill employees. A foodhandler who became ill on September 19 with laboratory-confirmed *C. parvum* infection prepared raw produce during September 20 – 22. All 25-C. *parvum* isolates submitted for DNA analysis, including three from the ill foodhandler, were genotype 1.

Conclusions: Epidemiologic and molecular evidence indicated that an ill foodhandler was the likely outbreak source. The occurrence of a large gastroenteritis outbreak due to contamination of food by one foodhandler illustrates the potential of *C. parvum* to cause large outbreaks.

9:55 ***Amy D. Sullivan, S. Maslanka, J. Kerr, B. Sokolow, P. Cieslak***

New Insights Contributed by Molecular Subtyping of *Clostridium Perfringens* Using Pulsed-field Gel Electrophoresis in an Outbreak of Foodborne Gastroenteritis — Oregon, 1999

Background: *Clostridium perfringens* is the fourth leading cause of bacterial foodborne illness in the United States. Confirming *C. perfringens* outbreaks is difficult: quantitative culture is insensitive, identifying enterotoxin is expensive, and many isolates can not be serotyped. During a September 1999 outbreak investigation of a potluck lunch attended by 130 persons in Portland, Oregon, we applied a new pulsed-field gel electrophoresis (PFGE) protocol for subtyping *C. perfringens*.

Methods: We administered a questionnaire to a convenience sample of 60 lunch attendees to assess symptoms and identify suspect foods, and cultured organisms from stools and selected foods. We performed PFGE on *Sma*I digests of *C. perfringens* isolates.

Results: Of 58 persons interviewed, 39 (68%) had diarrhea, usually with cramping but never vomiting. The median incubation period was 13 hours (range: 6 hours–32 hours). Thirty-eight (72%) of 53 persons who ate tamales became ill, compared to one (20%) of five who did not eat them (Relative Risk [RR]=3.5; 95% Confidence Interval=1.1–10.7). Thirty-nine (70%) of 56 persons who ate chicken with "mole" sauce became ill; the two who did not were not ill (RR, undefined). Quantitative cultures confirmed *C. perfringens* in tamales

and the chicken entree; two stool specimens had small numbers of organisms. PFGE identified two *C. perfringens* subtypes: one subtype occurred in both foods and one stool specimen, the other subtype occurred in tamales and the other stool specimen.

Conclusions: By matching PFGE patterns in food and stool isolates, we confirmed the role of two distinct *C. perfringens* subtypes associated with this multiple-vehicle outbreak. PFGE should prove useful for confirming *C. perfringens* outbreaks and improving our understanding of the epidemiology of *C. perfringens*.

10:15 *Thomas H. Tsang, S. Abbott, J. Richmond, E. Mintz, D. Vugia*
Brainerd Diarrhea Outbreak in California — Role of *Campylobacter Curvus?*

Background: Since Brainerd diarrhea was recognized in 1984, eight outbreaks have been identified. The cause, however, remains unknown. We investigated a cluster of patients with symptoms suggestive of Brainerd diarrhea in Humboldt County, California, in 1998.

Methods: A case was defined as ≥3 loose stools during a 24-hour period for ≥4 consecutive weeks with onset during October 1 – December 31, 1998. To identify additional cases, we sent letters to all primary-care physicians in the county. In a case-control study to identify the source of infection, we selected controls from dining companions and acquaintances matched by age and city of residence. We examined pathology reports and tested stool samples of case-patients and their family members. Molecular typing was performed using pulsed-field-gel electrophoresis (PFGE).

Results: Illness in 23 patients met the case definition. The median age was 64 years (range:37–84 years). Diarrhea persisted 6 months after onset in 86% of case-patients. Case-patients commonly reported urgency (91%) and fecal incontinence (71%). Eating at one particular restaurant was significantly associated with illness (90% of cases versus 9% of controls; matched odds ratio:22.9; 95% confidence interval:[3.7,∞]). However, no food or beverage in that restaurant was implicated. All cases were negative for diarrheagenic bacteria, ova and parasites; pathology examinations did not establish any cause. Of the stool samples from six case-patients submitted for special testing, five (83%) grew *Campylobacter curvus*; in comparison, none of the stool samples from eight family members had *C. curvus* ($p<0.01$). However, the isolates each had different PFGE patterns.

Conclusions: We documented a restaurant-related Brainerd diarrhea outbreak in California. Although *C. curvus* was detected in the stool samples of some case-patients, the organism's role remains unclear.

10:55 Vaccine Safety. Moderator: Robert F. Breiman

11:00 *Piotr Kramarz, the CDC Vaccine Safety Datalink (VSD) Team*
Population-Based Cohort Study of Intussusception and Rotavirus Vaccination

Backround: In spring 1998, the Vaccine Adverse Event Reporting System received a number of reports of intussusception following rhesus rotavirus tetravalent (RRV-TV) vaccination. To study potential association, we conducted a retrospective cohort study using data from ten health maintenance organizations (HMOs).

Methods: Cases of intussusception were found by search of HMO databases for a discharge diagnosis of intussusception (ICD-9 code 560.0) in infants 1 – 11 months of age. Vaccination and enrollment information were obtained from administrative databases of HMOs. Incidence Rate Ratios (IRR) of intussusception were computed by dividing incidence rates (IR) in pre-specified risk intervals after vaccination by background rate of intussusception and adjusted for age by Poisson regression.

Results: In 6 of the 10 HMOs analyzed to date we identified 364,225 eligible children (9.3% of the U.S. birth cohort). 85,608 doses of RRV-TV were given to 50,671 children. Crude IR of intussusception among unexposed infants was 51/100,000 person-years (95% CI: 39 – 67/100,000). Crude IR for the period of 3 –

7 days among exposed infants was 700/100,000 (95% CI: 33 – 146 7/100,000). Crude IRR for the risk interval of 3 – 7 days was 13.8 (95% CI: 6.3 – 30.3) and age-adjusted IRR for this period was 13.4 (95% CI: 5.8 – 30.9). IRRs for the 8 –14, 15 – 21, and >21 were >1, but were not statistically significant. One case of intussusception occurred with every 12,000 doses of RRV-TV.

Conclusions: Preliminary results suggest the RRV-TV vaccine is associated with an increased incidence of intussusception. Risk was greatest 3–7 days after vaccination. Managed care organizations can quickly respond to questions of vaccine safety by providing the CDC with the large datasets necessary for these population-based studies.

11:20 ***Stephanie L. Sansom, L. Barker, P. Corso, C. Brown, R. Deuson***
Parental Attitudes Toward Rotavirus Vaccine

Background: Post-licensure surveillance suggested an increased risk of intussusception associated with rotavirus vaccine. This prompted interest in measuring the risk parents were willing to accept from a vaccine suspected to be associated with a rare, but serious adverse event. An estimated 2,000 cases of intussusception occur annually among non-vaccinated infants in the U.S.

Methods: In September 1999 interviewers conducted face-to-face surveys among a convenience sample of parents of infants in three cities: Denver, Colorado; Knoxville, Tennessee; and Columbus, Ohio. Interviewers described vaccine benefits and risk as incidence of morbidity and mortality from rotavirus diarrhea and from intussusception among a U.S. birth cohort of 3.9 million infants. Interviewers asked parents if they would accept two different vaccine-induced risks of intussusception. The responses provided a range for the acceptable number of cases of vaccine-induced intussusception. We estimated the true number of acceptable cases, a continuous variable, using univariate and multivariate models.

Results: Of 405 eligible parents, 260 (64%) participated in the survey. In univariate analysis, the median risk of vaccine-induced intussusception parents were willing to accept was 2,816 cases (95% CI:2,692, 2,939) among a cohort of fully vaccinated infants. In multivariate analysis including city, education, age and income, parents who were <21 years old had a median acceptance of 513 fewer vaccine-induced cases (95% CI:113, 913) than 21–24 year olds. Parents with annual household incomes >$75,000 had a median acceptance of 681 fewer cases (95% CI: 250, 1,112) than those with incomes of $15,001–$30,000.

Conclusion: Many parents indicated a willingness to accept some risk to achieve the benefits of rotavirus vaccine. Younger parents and wealthy parents indicated less willingness to accept risk.

11:40 ***Thomas M. Verstraeten, R. Davis, D. Gu, F. DeStefano, R. Chen, the Vaccine Safety Datalink-Team***
Risk of Neurologic and Renal Impairment Associated with Thimerosal-Containing Vaccines

Background: Thimerosal is a mercury-based preservative in vaccines. Theoretical concerns have been raised that, through vaccinations, infants were being exposed to mercury levels exceeding federal guidelines. We used automated data from four health maintenance organizations, prospectively collected for vaccine safety studies, to assess the risk of neurologic and renal impairment associated with exposure to thimerosal-containing vaccines.

Methods: Exposure to mercury from thimerosal was compared to the most conservative federal guideline for oral intake of methylmercury (0.1 μg Hg/Kg/day) for 338,080 infants born between 1991 and 1997. Using proportional hazards models, we compared the risk of developmental neurologic disorders, including autism and attention deficit disorder (ADD), and renal disorders in children exceeding to those not exceeding this guideline at one and three months of age.

Results: The guideline was exceeded by 60.7% of the children at one month and by 69.0 % at three months. We identified 3702 children with developmental neurologic disorders, of which 153 were autism and 346 ADD, and 310 with renal disorders. The relative risks at one and three months, respectively, were 0.95 (95 % Confidence Interval [CI]= 0.88–1.03) and 1.09 (95% CI 0.99–1.19) for neurologic developmental disorders, 0.87 (95% CI 0.67–1.12) and 0.80 (95% CI 0.60–1.06) for renal disorders, 1.01 (95% CI 0.72–1.41) and 1.15 (95% CI 0.76–1.75) for autism, 1.16 (95% CI 0.83–1.62) and 1.04 (95% CI 0.78–1.38) for ADD.

Conclusion: This initial analysis suggests that the risks of developmental neurological and renal disorders are not increased by exposures to mercury from thimerosal containing vaccines that exceed the most conservative federal guideline. Additional evaluation of higher exposure levels and verification of the automated data is planned.

Tuesday Afternoon — April 11, 2000

12:30 Poster Session No. 1 — Meet the Authors

(see Monday schedule for list of presentations)

1:45 Mackel Award Finalists. Moderator: Joseph E. McDade

1:50 *Lisa A. Grohskopf, V. Roth, D. Feikin, M. Arduino, L. Carson, S. Holt, B. Jensen, R. Hoffman, J. Tokars, W. Jarvis*

***Serratia Liquefaciens* Bloodstream Infections and Pyrogenic Reactions Associated with Extrinsically Contaminated Erythropoietin — Colorado**

Background: Since 1973, inflation-adjusted Medicare reimbursement for hemodialysis treatment has decreased substantially, prompting hemodialysis centers to implement cost-saving measures. Erythropoietin is an expensive drug received by most chronic hemodialysis patients. Some centers pool residual erythropoietin from multiple vials to access all available medication. When an outbreak of *Serratia liquefaciens* bloodstream infections and pyrogenic reactions occurred at Center A, we initiated an investigation.

Methods: We defined a case-patient as any Center A patient who developed fever (100 F) or rigors two hours after starting a hemodialysis session between June 30 and August 10, 1999. A case-session was a hemodialysis session during which the patient met the case-patient definition. We conducted a cohort study of all sessions on the same days as case-sessions. Risk factors assessed included age, sex, weight, hematocrit, underlying disease, vascular access type, session length, dialysis machine, dialyzer reuse number, and intravenous medications.

Results: Twenty case-sessions involving 15 patients occurred among 181 sessions involving 49 patients. In multivariate analyses, case-sessions were more likely to occur with erythropoietin doses >4000 U (OR = 5.14, 95% Confidence Interval 1.41–18.65). Single-use vials of erythropoietin were accessed multiple times. Residual erythropoietin was pooled into one vial for later use. Cultures of soap, hand lotion, pooled erythropoietin, and empty vials from two lot numbers yielded *S. liquefaciens* indistinguishable from case-patient isolates by pulsed-field gel electrophoresis. After implementation of control measures (cessation of pooling, emphasis on handwashing, and use of non-refillable soap dispensers), no additional cases occurred.

Conclusions: Our data document extrinsic contamination of erythropoietin via multiple punctures of single-use vials and pooling residual medication. Although pooling of erythropoietin may be cost beneficial, adverse risk to patients outweighs this benefit.

2:10 ***Belinda E. Ostrowsky, C. Whitener, L. Carson, H. Brendenberg, S. Holt, L. Hutwagner, M. Arduino, W. Jarvis***

***Serratia Marcescens* Bloodstream Infections in Surgical Intensive Care Unit Patients Traced to Extrinsic Contamination of an Infused Narcotic**

Background: When between June 30 and September 30, 1998, nine episodes of *Serratia marcescens* (SM) bloodstream infection (BSI) were detected in Hospital A's surgical intensive care unit (SICU) patients, CDC assistance was requested.

Methods: A case-patient was any Hospital A SICU patient with a SM-BSI during September 30, 1998–March 17, 1999 (epidemic period). To identify risk factors for SM-BSI, we compared case-patients to randomly selected controls (i.e., Hospital A patients in the SICU $\geq$48 hours during the epidemic period with no gram-negative bacterial BSI).

Results: Twenty-six case-patients were identified; three (12%) died. Of the BSIs, eight (30.7%) were polymicrobial. Case-patients were significantly more likely than controls to receive fentanyl by any mode in the SICU (odds ratio [OR]=31, p<0.0001), especially a continuous infusion (OR=42, p=<0.0001). Two healthcare workers (HCWs) had more exposure to case-patients than to controls in univariate and multivariate analyses (adjusted [A]OR=6.7, p=0.002; AOR=9.5, p=0.017). One of these HCWs had been reported at Hospital A for potential fentanyl tampering; a hair sample from this HCW tested positive for fentanyl. Cultures of unopened fentanyl vials were negative, whereas cultures of continuous fentanyl infusions from two case-patients grew SM. Pulsed-field gel electrophoresis (PFGE) of both case-patient and fentanyl infusion SM isolates were indistinguishable. Since removal of this HCW, no cases have occurred.

Conclusions: We report an outbreak of SM BSI in a SICU traced to extrinsic contamination of continuous fentanyl. Epidemiologic and laboratory studies implicated a HCW in potential fentanyl tampering and abuse. Our findings underscore the risk of patient complications associated with HCW drug abuse and the need for proactive HCW drug education programs.

2:30 ***Deborah A. Gust, S. Wang, C. Black, K. King, P. Quinlisk, W. Levine, M. St. Louis***

A Pseudo-Outbreak of *Chlamydia Trachomatis* in a State Residential Facility: Implications for Diagnostic Testing

Background: Approximately 20 million tests are performed annually for *Chlamydia trachomatis* genital infection, the most commonly reported sexually transmitted disease in the United States. In December 1998, a *C. trachomatis* outbreak was reported among 18 residents of a state residential facility that houses approximately 400 mentally retarded clients. An investigation was initiated to confirm the outbreak and identify risk factors for infection.

Methods: Client medical records and laboratory testing procedures were reviewed. Confirmatory tests were performed at CDC on all specimens reported to be positive for *C. trachomatis*.

Results: The 11 female and 7 male clients with reported chlamydial infections had a median age of 44 years (range, 28 to 87 years), were profoundly retarded, and had no physical signs of sexual abuse. The index case had tested positive for *C. trachomatis* by ligase chain reaction (LCR) test. Further testing was then performed on the 14 other clients in the index case's cottage and in the 15 clients living in an adjoining cottage. Among this group, all 17 clients with positive test results had been tested by chlamydia culture, whereas all 12 with negative results had been tested by DNA probe assay (p<0.001). At CDC, *C. trachomatis* DNA could not be detected in the LCR specimen nor in any of the 17 positive cultures. Review of the culture laboratory identified that chlamydia testing was infrequently performed and procedures were deficient.

Conclusions: This pseudo-outbreak, combined with other events, threatened the facility's accreditation and Medicaid funding. Findings from this investigation underscore that positive results of new and established *C.*

trachomatis screening tests are presumptive and need confirmatory testing, particularly when they may have serious ramifications for individuals and institutions.

2:50 ***John T. Brooks, D. Bergmire-Sweat, M. Kennedy, K. Hendricks, M. Garcia, L. Marengo, J. Wells, J. Duke, M. Ying, P. Griffin, R. Hoekstra, C. Friedman***
An Outbreak of Shiga Toxin-producing *Escherichia Coli* O111:H8 Infections Among Attendees of a Cheerleading Camp — Texas, 1999

Background: Most recognized outbreaks of Shiga toxin-producing *E. coli* (STEC) infections in the United States have been related to *E. coli* O157:H7. The burden of illness from non-O157 STEC, which may comprise half of all STEC infections (55,000 illnesses annually) remains unknown because few clinical laboratories test for serotypes other than O157. In June 1999, the first large U.S. outbreak of *E. coli* O111 infections occurred among teenagers attending a cheerleading camp.
Methods: We conducted a cohort study of camp attendees. Illness was defined as diarrhea (≥3 stool in 24 hours) with abdominal cramping, or bloody diarrhea, occurring within 14 days after arriving at the camp. Stools were first screened by enzyme immunoassay for Shiga toxin. STEC recovered from Shiga toxin-positive isolates were then serotyped.
Results: Of 650 camp attendees, 521 (80%) persons were interviewed; 58 (11%) met the case definition, of whom 37% had bloody diarrhea. Most illnesses began 2 days after camp began. Two persons developed hemolytic-uremic syndrome (HUS). There were no deaths. Multivariate analysis implicated two independent exposures: consuming ice from open buckets (odds ratio [OR] 3.35, 95% confidence interval [CI] 1.86–6.32, p=0.0001) and eating from the cafeteria salad bar (OR 3.50, CI 1.38–11.83, p=0.02). Of eight stools from ill persons, two yielded *E. coli* O111:H8. Shiga toxin was detected in a third culture-negative specimen. *E. coli* O157 was not isolated.
Conclusions: Assaying stools for Shiga toxin, then serotyping recovered STEC isolates, allowed detection of this outbreak caused by an emerging pathogen. We thus recommend that clinical laboratories screen stools for non-O157 STEC from patients with diarrhea-associated HUS or bloody diarrhea, and that non-O157 STEC infections be made notifiable.

3:30 Bacterial Diseases. Moderator: Jay C. Bulter

3:35 ***Stephanie J. Schrag, C. Peña, J. Sanchez, J. Fernandez, J. Feris, R. Besser***
Prevalence and Predictors of Drug-resistant *Streptococcus Pneumoniae* (DRSP) Carriage Among Children with Respiratory Illness — Santo Domingo, Dominican Republic

Background: *S. pneumoniae*, a leading cause of respiratory infection, is estimated to result in 1 million childhood deaths annually, mostly in the developing world. The emergence of drug- resistant strains poses a threat to treatment of infections. The importance of DRSP in developing countries, however, remains poorly described. We evaluated pneumococcal carriage among children in Santo Domingo, Dominican Republic, to characterize the prevalence and predictors of DRSP carriage.
Methods: Children 6 to 59 months old attending one urban outpatient clinic with respiratory illness requiring antibiotics were eligible for enrollment. Children using antibiotics in the last week were excluded. We collected demographic information and a nasopharyngeal specimen from participants. Pneumococci were isolated and screened by E-test for susceptibility to penicillin, amoxicillin and trimethoprim-sulfamethoxazole.
Results: We enrolled 164 children (median age 1.4 years, range 0.5–4.7); 48% had acute respiratory illness and 35% had otitis media. *S. pneumoniae* was isolated from 127 (77%) participants. DRSP was common among isolates: nonsusceptibility to penicillin, 33%; trimethoprim-sulfamethoxazole, 24%; and amoxicillin, 9%. Having 3 or more children in the household was associated with DRSP carriage (odds ratio = 2.4; 95%

CI = 1.1–5.0), as was day care or school attendance (OR = 4.7, 95% CI = 1.4–15.6), although this occurred in only 9% of participants. Antibiotic use in the previous 2 months, either by participants or household members, was not associated with DRSP carriage.

Conclusions: Children in the Dominican Republic with respiratory illness had a high rate of pneumococcal carriage. The prevalence of penicillin and trimethoprim-sulfamethoxazole non-susceptibility is of concern because these are often the only therapies available in developing settings. The new pneumococcal conjugate vaccine holds promise as an effective intervention against disease and resistance.

3:55 *James P. Watt, K. O'Brien, A. Benin, K. Robinson, C. Whitney, R. Reid, M. Santosham*
Invasive Pneumococcal Disease in Navajo Adults, 1995–1998

Background: Compared with the general U.S. population, Navajo adults are at increased risk for invasive pneumococcal disease (IPD). We attempted to characterize cases among Navajo adults and to develop hypotheses for study of risk factors.

Methods: Johns Hopkins University and the Navajo Nation conduct active surveillance for IPD. During 1995–1998, 342 cases in Navajo adults were identified. We reviewed the medical records of 270 (78.9%) case-patients. Data for the U.S. population were drawn from CDC's Active Bacterial Core Surveillance (ABCs) for 1998.

Results: The median annual incidence was 48.9/100,000 (range 38.5–56.2) for Navajos 18–64 years and 166.4 (range 122.3–237.8) for Navajos ≥65 years. The corresponding rates were 10.2 and 56.8 for U.S. whites and 43.6 and 82.1 for U.S. blacks. Navajos were hospitalized in 88.5% of cases compared with 94% of ABCs patients. Case-fatality rates (CFR) for Navajos were 10.3% (18–64 years) and 16.0% (≥65), similar to U.S. whites (10.9% and 16.2%, respectively) and blacks (9.0% and 17.0%, respectively). For 30% of case-patients there were no Advisory Committee on Immunization Practices designated indications for vaccination (age ≥65 years or medical condition). The 23-valent vaccine covered the serotypes responsible for 79.8% of cases (206/258 cases with known serotype) compared with 85.7% of ABCs isolates.

Conclusions: Compared with U.S. whites and blacks, Navajo adults, particularly those ≥65 years, are at increased risk for IPD. Disease severity, as measured by hospitalization and CFR, was similar between the three populations. Thirty percent of Navajo case-patients would not have been eligible for pneumococcal vaccination using age-based or medical indications. Poor coverage of disease serotypes by the 23-valent vaccine does not appear to explain the increased disease rates.

4:15 ***Montserrat Soriano-Gabarró, J. Butler, J. Jacob, B. Gessner, D. Bruden, N. Murphy, D. Hurlburt, S. Galvin, S. Hulman, A. Schuchat***

Epidemiology of Neonatal Sepsis Caused by Group B Streptococci and Other Bacterial Pathogens Among Alaska Newborns

Background: Group B streptococci (GBS) are a major cause of neonatal sepsis. Nationally, neonatal GBS disease cost 300 million dollars per year until recent prevention efforts were implemented. GBS neonatal disease declined dramatically in several areas from 1993 to 1998. Alaska hospitals implemented intrapartum antibiotic prophylaxis (IAP) in the early 90s. The burden of neonatal GBS disease and the impact of IAP has not been evaluated for Alaska populations.

Methods: We conducted a retrospective review of neonatal sepsis patients admitted to all hospitals with neonatal intensive care units in Alaska during 1991 to 1998. Denominator data for Alaska newborns were obtained through birth certificate records. Neonatal sepsis was defined as isolation of a bacterial pathogen from blood, cerebrospinal fluid or another normally sterile site. Chi square for trend was used for incidence comparisons.

Results: Rates of GBS disease decreased from 0.71/1000 live births in 1993–1994 to 0.20/1000 live births in 1997–1998 (χ^2 for trend=6.4, p =0.01). Rates of GBS disease were similar for Alaska Natives and non-Natives. Among 86 cases of sepsis, GBS caused 41.9%, *Escherichia coli* 15.1%, *Staphylococcus aureus* 8.1%, *Enterobacter cloacae* 5.8%, *Haemophilus influenzae* 5.8%, and *Streptococcus pneumoniae* 2.3%. Non-GBS patients were more likely to be premature and have low birth weight (p=0.001). Mortality was higher among non-GBS patients than among GBS patients (22.% vs 8.3%, p 0.09).

Conclusion: GBS is the main cause of neonatal sepsis among newborns in Alaska, affecting both Alaska Native and non-Native populations. Sepsis caused by other organisms is more often a disease of prematurity. Decreasing rates of GBS disease among newborns in Alaska may be related to the introduction of IAP policies.

4:35 ***Terri B. Hyde, M. Gilbert, S. Schwartz, J. Watt, W. Thacker, D. Talkington, R. Besser***

Azithromycin Prophylaxis During a Hospital Outbreak of *Mycoplasma Pneumoniae* Pneumonia

Background: *Mycoplasma pneumoniae* (MP) is a common cause of atypical pneumonia in adults. Because of difficulties diagnosing MP and its long incubation period, MP-related pneumonia outbreaks can last several months in closed communities. Azithromycin chemoprophylaxis has not been evaluated as a means of limiting disease transmission.

Methods: Randomized, double-blinded placebo-controlled trial of azithromycin for prevention of illness in asymptomatic psychiatric hospital employees during an outbreak of MP pneumonia. Oropharyngeal swabs were obtained for detection of MP by polymerase chain reaction at enrollment, 1 and 6 weeks later. Symptom questionnaires were collected biweekly.

Results: We enrolled 147 employees: 73 in the azithromycin group and 74 in the placebo group. MP carriage at enrollment was 9.6% and 6.7% in the drug and placebo groups, respectively (P= 0.39). Carriage was similar within and between groups at 1 and 6 weeks: 6.9% and 10.3% in the drug group vs. 10.8% and 13.2% in the placebo group. Six episodes of respiratory illness requiring medical attention or antibiotic therapy occurred in the azithromycin group versus 16 episodes in the placebo group (RR 0.38; CI 0.16, 0.92). The clinical difference between groups was most evident during the 4th and 5th weeks after treatment (0 vs. 7 cases, RR 0; CI 0, 0.52).

Conclusions: Azithromycin prophylaxis did not significantly affect MP carriage during the study. However, there was a dramatic difference between the groups in the development of respiratory illness requiring a doctor's visit or antibiotic administration. This effect was most significant early in the second incubation period of MP. Azithromycin prophylaxis of asymptomatic persons during an outbreak of MP pneumonia in a closed setting may be of value in reducing clinical illness.

Tuesday Evening — April 11, 2000

Special Session — International Night

Sponsored by the Training in Epidemiology and Public Health Interventions Network (TEPHINET)

7:30 From Evidence to Action in International Health. Moderator: Alan R. Hinman

7:35 ***Romualdo Barbato, A. Claveria, J. Zuasula, Jr., M. Montecillo, L. Gabriel, G. Viola, M. Roces***
Typhoid Fever Outbreak in a Coastal Town — Cebu Province, Philippines, 1999

Background: In April 1999, the regional epidemiology and surveillance unit detected suspected cases of typhoid fever in a coastal town in Cebu Province. An investigation was conducted to identify source(s) of infection and risk factors for getting disease.
Methods: We obtained a line listing of cases from the health center to conduct a matched case-control study. Blood samples from febrile patients and rectal swabs from afebrile patients and controls were cultured. Case-patients were persons who had fever for ≥five days along with constitutional signs and symptoms. Controls were well persons from the nearest unaffected household who had negative rectal swabs. We also did an environmental sanitation survey.
Results: Forty-eight case-patients from seven villages were identified. Thirty (62%) of the 48 were from one village, Langtad. Twenty-two (73%) of 30 Langtad case-patients were male. The median age of the case-patients was 14 years (range: 10 months-38 years). Five (33%) of 15 blood samples grew *Salmonella typhi*. Drinking water from the local waterworks (OR 4.2, 95% CI 1.3-18.7) was a risk factor for disease. Drinking water from public deep wells was protective (OR 0.17, 95% CI 0.02-0.73). The town has no sanitary garbage disposal system and many households do not have sanitary toilets. During the investigation, there was no chlorinator at the main reservoir. For several weeks, chlorination was done manually. Water samples from the reservoir were positive for coliforms.
Conclusions/Public Health Impact: The probable cause of the outbreak was the temporary lapse in standard chlorination procedures at the water reservoir. Consumers received contaminated water. Subsequently, the chlorinator was repaired, additional chlorinators were acquired, sanitary toilets were constructed, and water quality monitoring was improved. A temporary municipal dump site was created and the municipal council is studying a sanitary waste-management system. No more cases of typhoid have been reported in this locale since April 1999.

7:55 ***Robinah Najjemba, G. Pariyo, L. Marum***
Management of Sick Children in Mbarara District, Uganda, Africa: Are Health Workers and Caretakers Partners?

Background: Management of sick children is a joint responsibility of Health Workers (HW) and caretakers. HW see sick children at the health unit, but most ill child care takes place in homes. The Integrated Management of Childhood Illnesses (IMCI) program requires HW to inform caretakers about a child's diagnosis and follow-up visits, and to give advice about feeding, fluid intake, and administration of prescribed drugs. HW are also expectd to check caretakers' understanding of home care instructions. To ensure correct oral drug dosages, HW give the first oral dose at the health unit. The outcome of the child's condition largely depends on advice given by HW.

Methods: This cross-sectional, descriptive study was done in 16 primary health facilities. The study employed standardized observation checklists to assess clinical skills of HW. Standardized structured questionnaires were used for the caretakers' exit interviews. A purposive selection sample of 30 health workers were observed and 220 caretakers were interviewed.

Results: Most children (95%) were managed as outpatients. Only 35% of the caretakers were told their child's diagnosis, and only 60% were told when to return for follow up. Only 26% were advised to continue with feeding, 56% were advised to increase fluid intake, and 14.5% were told to complete the prescribed drugs. Only 4% of the caretakers were shown how to give oral treatments. Forty-one percent of caretakers were checked by the HW for understanding. Under-staffing, patient overload, and lack of knowledge and counseling skills were the reasons given by HWs for poor performance. Caretakers, however, decried poor HW attitudes.

Conclusions/Public health impact: Information about diagnosis and home nursing care was generally poor. Most children were sent home on treatment while HW did not manage sick children with complete participation of the caretakers. HW need communication training to work with caretakers as partners to improve home care nursing of childhood illnesses. In-service training for the health workers was carried out.

8:15 ***Diane M. MacDonald, M. Fyfe, A. Paccagnella, J. Fung, J. Harb, K. Louie***
***Escherichia Coli* O157:H7 Outbreak Linked to Salami — British Columbia, Canada, 1999**

Background: *Escherichia coli* O157:H7 (0157) is an emerging cause of foodborne illness with public health implications. An outbreak of 0157 was declared in November 1999 with a fivefold increase in the occurrence of laboratory confirmed O157 cases in British Columbia. This prompted an intensive investigation by local, provincial and national public health officials.

Methods: Interviews of case-patients were conducted utilizing a broad food history and environmental exposure survey. Laboratory investigations involved both case-patient and food sampling; specimens were taken of foods sold locally and reportedly consumed by the case-patients. A case-control study was undertaken involving 19 cases and 19 sex- and age-matched controls. A comprehensive environmental investigation of the implicated processing plant was conducted.

Results: Thirty-eight case-patients were identified over a 4-week period; all had 0157 isolates with the same PFGE pattern. Interviews with case-patients suggested that Company A Type B salami purchased at local grocery stories and delicatessens was associated with illness. The case-control study identified Company A Type B salami as the most probable source of the outbreak (Mantel-Haenszel matched odds ratio=10.00; p<.005; 95% CI=1.42,434). Samples of Company A Type B salami tested positive for O157 with the same PFGE pattern as cases. Initial environmental investigations revealed manufacturing practices that could allow the survival of O157 in the market product.

Conclusions/Public Health Impact: This is the second large Canadian outbreak of *E. coli* O157:H7 attributed to dry fermented salami. Findings from the case series investigation resulted in an immediate voluntary national recall of Company A dry fermented meat products. The epidemiologic and laboratory investigations, linking Company A Type B salami with disease, attest to the risks associated with this type of ready-to-eat food product. A review of Canadian standards and the effectiveness of their implementation is warranted.

8:35 ***Chawetsan Namwat, S. Iamsirithaworn, W. Hanchaoworakul, C. Jiraphongsa, N. Mahayodsanan, A. Thanawong***
Cluster of Facial Palsy: The First Report in Thailand

Background: From January to September 1999, a district hospital doctor noticed 17 cases of facial palsy in a low-land area. In Thailand, a cluster of facial palsy cases has never been reported, so we studied the cause and risk factors of this outbreak.

Methods: We defined a case-patient as a person who developed symptoms of mouth angle drooping and unclosed eyelid on the same side without known cause between January and September, 1999. We reviewed medical records of all case-patients seen in the community hospital. We conducted a case-control study by selecting three controls from three different neighborhood households for each case-patient. Sera obtained from all cases and controls were examined for antibodies to *Angiostrongylus* and *Gnathostoma*, larva migrans parasites.

Results: There were 20 cases (incidence 37/100,000); the median age of case-patients was 43 years (range:15-72). Eleven (55%) were male, and 13 (65%) were farmers. There was no obvious cluster of cases in a specific village. Seventeen (85 %) case-patients developed symptoms between July and September, the rainy season. Concurrently, an epidemic of eosinophilic meningitis occurred in the community. A case-control study showed a strong association between eating raw fish and being a case (OR=5.9; 95% CI= 1.4-28). We also found a statistically significant dose-response relationship between eating raw fish and illness (OR=12 for eating more than three times, OR=3 for eating one to two times, p=0.002). Eating raw prawn, fermented fish and fresh water plants did not show any association. Preliminary serological tests showed that 4 of 6 case-patients had IgG antibodies to both *Angiostrongylus* and *Gnathostoma*.

Conclusions/Public Health Impact: Facial palsy is not a rare disease in Thailand, especially in rural areas. This cluster might have been caused by larva migrans which can cause eosinophilic meningitis. Eating raw fish was a risk factor. The definite etiology is under investigation.

8:55 ***Sarah L. Lathrop, M. Bunning, D. Singer, T. Tiwari, L. Baber, P. Reiter, B. Biggerstaff, J. Thirion, J. Mendez, B. Ramirez Mante, J. Robinson, J. Rawlings, V. Vorndam, S. Waterman, G. Clark, E. Hayes***

Dengue Serosurvey in the Laredo/Nuevo Laredo Border Community — Texas and Mexico, 1999

Background: Locally acquired dengue is rare in Texas, despite the presence of the mosquito vector (*Aedes aegypti*) and high transmission rates in Mexico. In August 1999, three indigenously acquired dengue cases were reported in Laredo, Texas, concurrent with a dengue outbreak in Nuevo Laredo, Mexico. We conducted a household survey to compare risk factors for dengue transmission in both cities.

Methods: Using cluster sampling of households, we collected information on risk factors using questionnaires and a survey for mosquito-infested containers. Blood samples from 517 household residents were tested for anti-dengue IgM and IgG. We used logistic regression to determine risk factors for seropositivity.

Results: In Nuevo Laredo IgM and IgG seroprevalence estimates were 16.0% (95% confidence interval [CI]=0.90–22.2) and 47.8% (95% CI=41.0–54.5), respectively, compared to 1.3% (95%CI=0–2.8) and 22.5% (95% CI=17.0–28.0) in Laredo. Risk factors for IgM seropositivity included evaporative coolers (adjusted odds ratio [AOR]=2.1, 95% CI=1.1–4.2) and no travel to other cities (AOR=2.3, 95% CI=1.1–4.7). Risk factors for IgG seropositivity included no air conditioning (room units, AOR=1.9, 95% CI=1.1–3.5; central, AOR=2.8, 95% CI=1.2–6.3) and lack of window screens (AOR=1.9, 95% CI 1.03–3.6). In Mexico, the house index and Breteau index were 24.6% and 38, respectively, compared to 36.9% and 91 in the U.S.

Conclusions: Residents of Nuevo Laredo had a higher seroprevalence of anti-dengue antibodies than residents of Laredo. Air conditioning and screens appear to protect against dengue, while evaporative coolers appear to increase infection risk. These findings contribute to the understanding of different levels of dengue transmission risk on the border and may lead to the development of improved prevention strategies.

9:15 ***Teresa Pelayo, A. Pousa, C. Pons Sanchez, L. González, C. Sánchez, I. Pachón, D. Herrera, F. Martínez***

Study of Two Outbreaks of Mumps in Children Vaccinated with the Rubini Strain in Spain: Estimation of Vaccine Efficacy

Background: In the second semester of 1998, the National Public Health Surveillance Network detected outbreaks of mumps in two Spanish towns, Almoradí (Valencian Region) and Manacor (Balearic Islands). Both outbreaks were characterized by an atypical age distribution and vaccination status among those affected: most were 2 through 5 years of age, and nearly all had been vaccinated. This study describes the epidemiologic features of and estimates vaccine efficacy for both outbreaks.

Methods: For each epidemic, a descriptive study was conducted, followed by a vaccine efficacy study which targeted cohorts receiving different vaccine strains. The Almoradí cohort was from the general population. The Manacor cohort was from a school population. Vaccine efficacy (VE) was obtained by applying the following formula: 1-[Relative Risk (RR)]; RR= vaccinated attack rate/non-vaccinated attack rate.

Results: In Almoradí, 150 case-patients were identified. The incidence rate was 2.87%; ages ranged from 4 to 41 years (median, 5 years; mode, 4 years). In Manacor, 216 case-patients were identified. The incidence rate was 0.72%; ages ranged from 1 to 41 years (median, 4 years; mode, 3 years). Ninety-three percent of case-patients in both outbreaks had been vaccinated. In Almoradí, the RR of mumps for those vaccinated with any vaccine strain was 0.85 (0.37 - 1.79), and the VE was 14.9% (-97.4 - 63.4). In Almoradí, for the cohort vaccinated with the Urabe/Jeryl-Lynn strains of mumps vaccine, the RR was 0.15 (0.06 - 0.43), and the VE was 84.6% (57.5 - 94.4). For persons in Almoradí vaccinated with the Rubini strain, the RR was 4.01 (0.6 - 27.2), and the VE was <0.0%. In Manacor, the RR for those receiving any vaccine strain was 0.67 (0.22 - 2.01), and the VE was 33.4% (-101.4 - 78.4). For those in Manacor vaccinated with Rubini-strain, the RR was 0.6 (0.22 - 1.66), and the VE was 40% (-66 - 78.3).

Conclusions/Interventions: Both outbreaks were caused by the low efficacy of the Rubini strain anti-mumps vaccine. The Ministry of Health has removed the Rubini-strain vaccine from the general population of all Spanish provinces and established an alert system for mumps oubreaks in persons who have received the Rubini strain vaccine.

Wednesday Morning — April 12, 2000

8:30 Animals and Human Disease. Moderator: James E. Childs

8:35 ***Paul T. Kitsutani, M. Lye, S. Kew, U. Parashar, A. Mounts, M. Bunning, J. Rani, J. Olson, J. Aziz, B. Ong, P. Stockton, M. Sinniah, P. Daniels, H. Field, S. Lam, M. Taha, T. Ksiazek, for the Malaysian Encephalitis Outbreak Task Force***

Investigation of an Outbreak of Viral Encephalitis — Malaysia, 1998–1999

Background: Between September 1998 and May 1999, an outbreak of encephalitis occurred in Malaysia. Investigations by officials from Malaysia, Australia, and CDC led to the discovery of a new paramyxovirus, Nipah, as the etiologic agent. Infected pigs were the primary source of human infection. Understanding the epidemiology of this emerging disease in humans is necessary to develop future prevention strategies.

Methods: Case ascertainment was performed by reviewing the demographic and clinical features of encephalitis patients with physicians and public health officials, and reviewing hospital records. Active surveillance was established to identify new cases. A case-control study of pig farm workers and a hospital cohort study were performed to determine risk factors for infection. Serum and cerebrospinal fluid specimens

were tested for Nipah virus antibodies by using a cross-reacting Hendra antigen IgM and IgG enzyme-linked immunosorbent assay (ELISA).

Results: Of 282 patients with clinical encephalitis, 216 (77%) had laboratory-confirmed Nipah virus infection and 108 (38%) died. Five geographic clusters in three states were identified. The median age was 38 years (range= 1 to 75 years); 82% were male, and 70% were Chinese. Seventy-eight percent of the patients were pig farmers, and 19% had lesser degrees of exposure to pigs on farms. Activities involving direct or close contact with pigs were risk factors for infection (OR=5.62; 95% CI=2.03–15.30). None of the physicians, nurses, or other hospital staff who directly cared for infected patients, became infected.

Conclusions: Nipah virus encephalitis is a new zoonotic disease associated with high mortality. Continued surveillance and early recognition of disease in humans and pigs in Malaysia and other pig-breeding countries will be important in preventing future outbreaks of this magnitude.

8:55 ***Enzo R. Campagnolo, S. Bragg, M. Warwick, H. Marx, Jr., R. Cowart, H. Donnell, Jr., M. Bajani, E. Esteban, D. Alt, J. Tappero, C. Bolin, D. Ashford***

An Outbreak of Swine-Associated Leptospirosis Among People in Missouri, 1998

Background: From 1947 through 1994, 2,958 cases of leptospirosis, a potentially fatal disease, were reported among people in the United States. Sporadic outbreaks continue to occur. Leptospirosis is an important zoonotic disease among swine farmers and abattoir workers, but the risk factors for infection among these groups are not completely understood. On November 10, 1998, an abattoir worker at the University of Missouri-Columbia (UMC) became ill with leptospirosis. The objective of our investigation was to determine the extent of human infection, source of transmission, and risk factors in order to prevent further cases.

Methods: We conducted a cross-sectional study of all people handling the swine and a risk factor analysis for leptospirosis infection. We interviewed subjects and collected blood samples for leptospiral antibody testing. We performed serology on random samples obtained from UMC swine.

Results: Of the 240 potentially exposed individuals, 163 (68%) were interviewed, and 110 (67%) of those interviewed submitted blood samples. From the 110 people that submitted blood samples, nine (8%) cases of leptospirosis were serologically confirmed. Risk factors for leptospirosis infection included smoking (Odds Ratio [OR] = 14.4; 95% Confidence Interval [CI] = 1.39–137.74) and drinking beverages (OR = 5.1; 95% CI = 1.04–24.30) while working with infected swine. Washing hands after work was found to be protective (OR = 0.2; 95% CI = 0.03–0.81). The swine serology indicated that 59% of the herd (n = 1,700) had leptospirosis titers denoting exposure.

Conclusions: Leptospirosis infection remains a potential concern among swine workers. The risk for infection may be prevented through appropriate hygiene, including hand-washing, and abstaining from smoking or drinking beverages while working with pigs.

9:15 ***Melinda J. Wilkins, S. Bidol, M. Boulton, M.G. Stobierski, B. Robinson-Dunn, J. Massey***
Young Poultry from a Contaminated Hatchery: The Source of a *Salmonella Infantis* Outbreak in Michigan, 1999

Background: Although approximately 95% of illnesses caused by human nontyphoid *Salmonella* species are transmitted by foodborne vehicles, direct animal contact remains an important source of infection. In the 1990s, at least four *Salmonella* outbreaks have been traced to contact with chicks or ducklings, but none linked human illness and an epidemiologically implicated hatchery using pulsed-field gel electrophoresis (PFGE).
Methods: To investigate 19 patients with identical PFGE patterns, we defined a case-patient as a Michigan resident from whom *Salmonella* Infantis was isolated from April 1 through July 31, 1999 and whose PFGE pattern matched the outbreak strain. We conducted a case-control study comparing case-patients from 18 counties with two age- and neighborhood-matched controls. Eighty environmental and bird tissue samples were collected from an implicated hatchery; all *Salmonella* isolates underwent PFGE analysis.
Results: The study included 19 case-patients and 37 matched controls. During the 5 days before illness onset, 74% of case-patients resided in households raising young poultry (chicks, ducklings, goslings, turkeys, pheasants) from the hatchery compared with 16% of control-patients (matched OR 19.5; CI 2.9–378.1). No other common human exposures or poultry feed sources were identified. Seven hatchery samples (two environmental, five tissue) yielded *Salmonella* Infantis with PFGE patterns matching patients' isolates.
Conclusions: Young poultry from a Michigan hatchery were identified as the source of *Salmonella* Infantis infection in 19 Michigan residents. PFGE was critical in establishing the common exposure in geographically disparate cases and confirming the hatchery as the source of contamination. Three public health recommendations will be implemented after this investigation: improving hatchery sanitation, inserting safe handling instructions with hatchling shipments, and springtime public service announcements to increase awareness of this potential health risk.

9:35 ***Roumiana S. Boneva, A. Grindon, W. Switzer, S. Orton, W. Heneine, T. Folks, L. Chapman***
Is Simian Foamy Virus Transmissible by Transfusion?

Background: CDC surveillance identified simian foamy virus (SFV) infection in 11 healthy workers occupationally exposed to nonhuman primates (NHPs). This retrovirus is common and benign in NHPs. Of the six infected workers who donated blood regularly, at least two donated after the retrospectively documented date of infection. Contamination of blood products with HIV-1, a simian-origin retrovirus also benign in its natural host, had devastating consequences. We investigated whether SFV, a highly leukocyte-associated retrovirus, can be transmitted through transfusion of blood products from infected donors.
Methods: We identified consignees of blood products from one SFV-infected donor and are testing recipients and plasma derivatives for SFV using serology and polymerase chain reaction.
Results: Recovered Plasma from two of six donations made between 1992 and 1997 was sent for manufacturing into plasma derivatives—some marketed internationally. Samples of one lot each of albumin and plasma protein fraction tested SFV-negative. One of nine identified transfusable blood components was discarded. Two recipients of Packed Red Cells (PRC) and Fresh Frozen Plasma, respectively, had died; their diagnoses did not implicate retroviral infection. Three recipients of PRC, Leukoreduced Red Cells (PRF), and Platelets, respectively, tested SFV-negative 19 months to seven years after transfusion. Testing of two recipients (of PRC or Platelets) is pending. Final disposition of one PRF remains undetermined.

Conclusions: These initial results did not find evidence of SFV transmission among humans through transfusion of blood components or plasma derivatives. However, the probability of transmission in this specific setting was low and will further decrease as the blood banking community moves towards increasingly leukoreduced products. Thus, while this study continues, SFV-infected workers are advised not to donate blood or other tissues.

10:15 Injuries. Moderator: Christine M. Branche

10:20 *L. Keoki Williams, K. Quinlan, J. Samuelson, M. Anderson, K. Powell*
Pedestrian Fatalities in Metropolitan Atlanta, 1994–1998

Background: Atlanta is reportedly one of the most dangerous areas for walking in the United States. Following a series of highly publicized fatalities, we examined pedestrian deaths in the metropolitan area to determine trends and identify preventable factors.
Methods: A pedestrian fatality was defined as the death of a person on foot within 30 days after being struck on a public roadway by a motor vehicle during 1994–1998 in Cobb, DeKalb, Fulton, or Gwinnett counties. Medical examiner data from these counties were used to identify potential cases. Cases were confirmed using police reports. Pedestrian fatality rates for the United States were obtained from the National Highway Traffic Safety Administration.
Results: During the study period, 309 pedestrian fatalities occurred in the four-county area. The pedestrian fatality rate (per 100,000 population) increased 13%, from 2.53 in 1994 to 2.85 in 1998. During the same period, the U.S. pedestrian fatality rate decreased 8%, from 2.10 to 1.93. In Atlanta, 87 (44%) of 198 pedestrians struck after dark were on unlighted streets. Of 241 pedestrians tested at autopsy, 77 (32%) had a blood alcohol concentration ≥0.10 g/dL. Thirty-three (11%) of 309 pedestrian deaths occurred after a person exited a vehicle in traffic; 24 (73%) of these deaths were on interstate highways. Twenty-eight (9%) of the 309 pedestrians killed were struck while in a crosswalk.
Conclusions: Unlike the national rate, the pedestrian fatality rate in Atlanta has been rising. Improvements in pedestrian safety will likely require changes in engineering (e.g., improved street lighting), education (e.g., increased awareness of the hazards of being an intoxicated pedestrian and of exiting a vehicle in traffic), and enforcement (e.g., ensuring drivers yield to pedestrians).

10:40 *Douglas R. Lyon, R. Rolfs, T. Grey*
An Epidemic of Deaths Related to Substance Abuse in Utah, 1991–1999

Background: During 1991—1999, Utah vital statistics data recorded a fourfold increase in deaths from "poisoning by solid or liquid substances, undetermined whether accidentally or purposely inflicted" (*International Classification of Diseases 9th Revision*, code 980). This category includes overdose deaths, prompting concern regarding an unrecognized epidemic.
Methods: State medical examiner (ME) and death certificate data were utilized to describe the increase. A substance abuse death was defined as one listed on the ME report as occurring by undetermined manner with morphine, heroin, fentanyl, methadone, cocaine or amphetamine. Deaths by prescription medication or when a patient was terminally ill were excluded.
Results: Of 11,213 cases investigated by the ME from January 1991 to June 15, 1999, a total of 533 met our case definition. Of the 533 case-patients, the median age of death was 36 years (range: 17– 62), 80% were male, 96% were white, and 75% were residents of Salt Lake County. Abuse with a single substance was noted in 49% of cases; 26% involved morphine, 14% cocaine, 5% amphetamine, and 4% methadone. Polysubstance use was common; 37% involved morphine and cocaine; 4% morphine and amphetamine; 5% morphine, cocaine, and

amphetamine. Alcohol was noted in 44% of deaths. Substance abuse deaths increased from approximately 20 in 1991 and 1992 to greater than 100 in 1997 and 1998, with rates increasing from 1 to 6/100,000 per year. The 1998 Salt Lake County rate reached 11.8/100,000 per year.

Conclusion: Substance abuse deaths in Utah increased precipitously during 1991–1998. Most deaths were associated with morphine used alone or with cocaine. Demographic data and information from other sources will further define this epidemic and guide prevention strategies.

11:00 *Diana M. Bensyl, J. Manwaring, G. Conway*
Flying the Unfriendly Skies: Inexperience May Increase Injury Crashes in Alaska, 1990–1998

Background: Vast mountain ranges and glacial ice impede road transportation in Alaska, making aircraft essential for providing goods and services. Professional pilots in Alaska have substantially increased risk for dying while working: over a 30-year career, they have an 11% chance of dying while working, compared to 2.5% for US pilots and 0.4% for non-pilot workers. To reduce this rate, determining factors underlying injury crashes and incorporating this knowledge into pilot training is necessary.

Methods: Data were abstracted from National Transportation Safety Board summaries for 1990–1998 air taxi crashes. Air taxi flights are commuter/on-demand flights for compensation in an airplane/rotorcraft that begin and end at the same airport. Injury crashes (including fatalities) were compared to non-injury crashes by pilot flight-time experience, day or night, visibility, and number of passengers. Fatal versus non-fatal crashes were also evaluated.

Results: During 1990–1998, 309 air taxi crashes occurred: 131 injury (49 fatal, 82 non-fatal), and 178 non-injury. Thirty-four percent of pilots involved in injury crashes were early-career (540–4800 hours experience) and 16% very early-career (1200–1800 hours). Very early-career pilots (VECPs) had a higher frequency of injury crashes than 1801–4800 hour pilots (43% versus 40%) and fatality crashes (24% versus 14%). Injury crashes were significantly associated with low-visibility for VECPs (Rate Ratio=14.30, 95% Confidence Interval=2.35–145.72). VECPs were significantly more likely to have an injury crash in low visibility than 1801–4800 hour pilots (X^2=28.26, $p<0.01$). Night flights and number of passengers were not associated with increases in injury or fatality crashes.

Conclusions: Air taxi injury/fatality crashes in Alaska might be decreased by improving pilot training as well as by adding safety programs and refresher training for pilots at all flight-time levels.

11:20 *Megan M. Davies, M. Kohn, H. Flood*
Experiences of Violence and Storage of Firearms — Louisiana, 1998

Background: Since 1990, firearms have been the leading cause of injury death in Louisiana. Since some firearm injuries result from unintentional or impulsive acts, gun storage practices that facilitate easy access to loaded guns might contribute to firearms injuries and therefore might be a target for firearm injury prevention.

Methods: A statewide random-digit-dial telephone survey of adult residents in Louisiana in 1998 allowed us to assess the relationship between firearm storage practices and experiences of violence. Experiences of violence among respondents who stored their guns most accessibly were compared to experiences of violence among all other gun owners. "Most accessible storage" was defined as storing any guns loaded and unlocked.

Results: Of 1,808 adults surveyed, 949 (52%) reported having a gun in the household. Of those, 195 (21%) stored them most accessibly. Respondents who stored guns most accessibly had a higher prevalence of knowing a recent victim of violence (48/180 versus 95/554, prevalence ratio [PR]=1.6, confidence interval [CI] 1.2–2.1) or of having been a recent victim of violence (16/57 versus 179/892, PR=1.4, CI 0.9–2.2). Women who stored guns most accessibly had a higher prevalence of having been sexually assaulted (21/76 versus 74/464, PR=1.6, CI 1.0–2.4).

Conclusions: Storing guns most accessibly is associated with having been a victim of violence or knowing someone who has been a victim, suggesting that the perceived need for personal protection might in part drive storage behavior towards accessibility.

11:40 ***Dafna Kanny, R. Schieber, V. Pryor***
Effectiveness of a State Law Mandating Bicycle Helmet Use Among Children — Florida, 1999

Background: Bicycle-related head injuries cause about 150 deaths and 45,000 nonfatal injuries among children 0–14 years in the U.S. annually. Bicycle helmets prevent up to 88% of such head injuries, yet only 25% of children always wear one. Florida leads the nation in bicycle-related deaths and injuries, with 1.49 such deaths per 100,000 children, nearly five times the national rate. Previous self-reported surveys have indicated the effectiveness of state bicycle helmet use laws, but were subject to social desirability bias. Hence, we conducted an observational survey to quantify effectiveness of a law, and to identify counties needing more intervention.
Methods: In 1997, Florida mandated helmet use for riders 0–15 years in all but three of its 67 counties. Unobtrusive observations at bicycle racks were made in Spring 1999 at each public grade school (K-5) of each county.
Results: Overall helmet use was 78% among 22,116 children observed at 1,012 elementary schools (95% school response rate). Where a state law existed, 17,184 (79%) of 21,665 riders wore a helmet, compared with only 148 (33%) of 451 riders where no such law existed (prevalence ratio 2.4, 95% confidence limits, 2.1 to 2.8). Additional analyses for effect modifications such as the existence of a school policy (33% of schools) will be presented.
Conclusions: Children from Florida counties with this state law were twice as likely to wear bicycle helmets, compared with children from counties without the law. These data support the *Healthy People 2010* recommendation that all 50 states should adopt bicycle helmet use legislation for children. Furthermore, this survey identified five counties for subsequent intervention.

Wednesday–Thursday Poster Session

12:30 Poster Session No. 2 — Meet the Authors

Illnesses in International Settings

P1. ***Farah M. Parvez, D. Roeshadi, L. Irmawati, Y. Sidharta, S. Rosenthal, M. Padmidewi, E. Irawan, D. Angsar, S. Holt, N. Puhr, M. Arduino, W. Jarvis, the Indonesia Study Group***
Investigation of *Salmonella* Serotype Worthington Causing Cellulitis, Sepsis, and Death in a Neonatal Intensive Care Unit — Indonesia, 1999

Background: *Salmonella* serotype Worthington has been implicated in neonatal intensive care unit (NICU) outbreaks in developing countries. From 7/1/98 – 3/23/99 (study period), 60 NICU patients at Dr. Soetomo Hospital (DSH), Indonesia, experienced rapidly progressive perianal cellulitis, sepsis, and death. Despite initial control measures, 24/60 (40%) infants died and an investigation was initiated.
Methods: We defined a case-infant as any DSH NICU infant who developed perianal cellulitis and suspected sepsis (i.e., temperature $\leq$ 36.5°C or $\geq$ 38°C, apnea, bradycardia, feeding intolerance, or diarrhea) during the study period. To determine risk factors for infection, we compared 60 case-infants to 120 controls.

Observational studies were done to assess healthcare worker (HCW) infection control practices. A prospective cohort study was initiated to determine the etiology of bloodstream infections (BSI) in suspected case-infants.
Results: Univariate analyses revealed that case-infants were more likely than controls to be premature (OR=12.1, p<.001), have birthweight ≤2500 grams (OR=6.5, p<.001), a history of perinatal asphyxia (OR=6.1, p<.001), or delivery by a community midwife (OR=6.4, p<.001) or cesarean section (OR=4.8, p<.001). Nurse-to-patient ratio was 1:10–1:20. HCWs inconsistently performed handwashing, universal precautions, or aseptic technique during patient care. BSI pathogens included non-*typhi Salmonella* spp. (44%); serotyping of the first 11 available case-infant isolates revealed *Salmonella* serotype Worthington, suggesting nosocomial transmission. Reinforcement of basic infection control practices resulted in termination of the outbreak.
Conclusions: Our data suggest that 1) person-to-person transmission of *S. worthington* occurred in the DSH NICU resulting in neonatal cellulitis and sepsis with a high fatality rate; 2) severely ill infants were at increased risk for infection; and 3) delivery practices may increase infection risk.

P2. ***Cristiana M. Toscano, C. L. Pessoa da Silva, A. L. Santos, M. Falcão, E. Campo, E. Amorim, C. Solari, W. R. Jarvis***
Outbreak of Multidrug-Resistant *Salmonella Infantis* Bacteremia in a Neonatal Unit — Brazil, 1999

Background: *Salmonella infantis* (SI) has not been reported previously to cause nosocomial bacteremia in neonates. We describe an outbreak of multidrug-resistant SI (MRSI) in a neonatal-unit (NU) at Hospital A in Brazil, associated with high mortality and cost. During July 98–May 99 (epidemic period), an increased number of neonates were diagnosed with MRSI and CDC investigation was initiated.
Methods: A case-control study was conducted. A case-patient was defined as any NU patient with positive MRSI blood culture and clinical symptoms during the epidemic period. Case-patients, identified by microbiology review, were compared to randomly selected patients without bacteremia (control-patients). Selected environmental cultures and a stool-culture prevalence survey were performed. Observational studies were conducted to assess infection control practices (ICP).
Results: Twenty seven case-patients were identified; 9 (33%) died. Case-patients had lower gestational age (median 32 vs 34 weeks, p=0.003), more intravenous catheter (IVC) manipulations in the 48 hrs before infection (median 6 vs 0, p=0.01), were more likely to have an IVC (OR 4.76, p=0.006), or to receive a blood transfusion (OR=21.9, p<0.001). Hospital stay (median 38 vs 24 days, p=0.01) and cost (median US$ 2,027 vs 994, p=0.003) were higher in case-patients than controls. Environmental cultures grew MRSI from intravenous-stands, scales and incubators. The prevalence survey revealed 51/117 (43.6%) MRSI-colonized patients. Observations identified inadequate cleaning and handwashing. Prompt case-identification, cohorting of colonized patients, enhanced staff handwashing, and environmental cleaning terminated the outbreak.
Conclusions: Our results demonstrate that strict adherence to ICP, including proper IVC manipulation and cohorting controlled this outbreak. In international settings, education of healthcare workers and adequate ICP may avoid excess mortality, hospital stay, and cost.

P3. ***Annette H. Sohn, F. Parvez, T. Vu, H. Hai, N. Bich, L. Thu, L. Hoa, N. Thanh, T. Viet, L. Archibald, W. Jarvis***

Prevalence of Surgical Site Infections and Antimicrobial Use and Resistance in a Hospital in Vietnam

Background: In many developing countries, surgical site infections (SSIs) are the most important cause of nosocomial infections, yet their prevalence and risk factors have not been determined in Vietnam. In addition, with increasing worldwide emergence of antimicrobial (AMB) resistance, appropriate AMB use is a priority. AMB use in surgical patients has not previously been characterized in healthcare facilities in Southeast Asia.
Methods: On August 25, 1999, we conducted a point prevalence survey of SSI and AMB usage at Cho-Ray Hospital (CRH), Ho Chi Minh City, a 1500 inpatient facility. We included all patients on the 12 surgical wards and two intensive care units who had a surgical procedure during their admission.
Results: Of 395 surgical patients, 61 (15.4%) had an SSI. When comparing patients with or without SSI, SSI risk factors included trauma (OR 3.47, CI 1.88–6.41; p<0.0001), emergency surgery (OR 2.22, CI 1.23–4.02; p=0.004), or dirty wounds (OR 6.78, CI 3.49–13.22; p<0.0001). Overall, 201 (51%) patients received non-prophylactic AMBs before surgery (PRE) and 394 (99.7%) received AMBs after surgery (POST). Commonly used AMBs included: cephalosporins (CP) (PRE n=93 [46%]; POST n=268 [68%]), and aminoglycosides (AG) (PRE n=62 [31%], POST n=247 [63%]). Of 30 isolates cultured from 22 patients with SSIs, 24 (80%) were resistant to 3rd generation CPs and 23 (77%) to an AG; 18 (82%) patients were receiving ineffective AMB therapy.
Conclusions: Our data show that (1) SSIs are prevalent at CRH; (2) AMB use in surgery patients is prevalent and inconsistent with published guidelines; (3) pathogens often are resistant to commonly used AMBs. Our data suggest that SSI prevention interventions, including appropriate use of AMBs, are needed.

P4. ***Heidi L. Blanck, B. Woodruff, M. Serdula, L. Kettel Khan, B. Bowman, M. Larson, A. Duffield, P. Garry, E. Gunter***

Outbreak of Angular Stomatitis Among Adolescents in Bhutanese Refugee Camps — Nepal, 1999

Background: From December 1998 to March 1999, reported cases of angular stomatitis (AS) among Bhutanese refugees living in camps in Nepal increased six-fold (from 5.5 to 35.6 cases per 1000 refugees), after withdrawal of a fortified cereal from rations. Adolescents had the highest rates of AS. AS may be non-specific but most often indicates deficiency of riboflavin, a water-soluble vitamin essential for proper neuromuscular and neurological function. In October 1999, a survey was performed to examine AS and riboflavin levels among adolescents in the camps.
Methods: AS was defined as fissuring at the angles of the mouth. A systematic random sample of 2% (n=463) of adolescents 10–19 years of age from registration data (n=26,235) was drawn. We conducted interviews, examined the mouth, and obtained blood specimens for micronutrient assessment from every other adolescent sampled and from all those with AS. Logistic regression was used to examine the association between AS and riboflavin status controlling for potential confounders (age, sex, camp, folate and vitamin B12 status).
Results: Of 463 adolescents, 133 (29%) had AS. Using an activity coefficient cutoff value of 1.70, inadequate riboflavin status was present in 228 (84%) of 271 adolescents assessed. Among those with AS, 67% had riboflavin status below the survey population mean, compared to 48% without AS, (adjusted OR=2.3, 95% C.I.=1.2,4.7). Low riboflavin levels increased progressively with severity of AS (Chi-square for trend p<0.01). AS was also related to younger age but not to sex or camp.

Conclusions: AS and low riboflavin status were common among adolescents in the refugee camp; low riboflavin levels were significantly related to AS. These results suggest that the change in fortified food led to the increase in AS. The fortified cereal has now been reinstated

P5. ***Bruce W. Furness, M. Beach, J. Trayner, A. Freeman, M-D. Milord, D. Addiss, P. Lammie***
Combined Treatment for Lymphatic Filariasis and Intestinal Helminth Infections in Haitian Schoolchildren

Background: *Wuchereria bancrofti* causes lymphatic filariasis (elephantiasis) and infects 100 million persons worldwide. Intestinal helminths infect over one billion persons worldwide. Because strategies for treating these parasites are similar, combination therapies are being considered for use in global efforts to eliminate *Wuchereria bancrofti*. Studies have shown that co-administration of ivermectin and albendazole for simultaneous control of lymphatic filariasis and intestinal helminths produced better results than either drug alone. We investigated the efficacy of diethylcarbamazine (DEC) co-administered with albendazole.
Methods: We measured height and weight and examined blood and stool samples from schoolchildren (grades 1–4) in Leogane, Haiti. Students were then randomly assigned to receive placebo, DEC, albendazole, or combined DEC/albendazole. We did follow-up assessments (heights, weights, and examinations of blood and stool) at various times up to 1 year post-treatment.
Results: Of 1292 students (mean age = 7.7 years), 15% had microfilaremia, and 69% were infected with intestinal helminths (hookworm=10%, *Ascaris*=31%, and *Trichuris*=54%). When compared to placebo at six months, DEC, alone or in combination with albendazole, significantly reduced the prevalence (46%, 70%, respectively, $p<0.001$), and density (50%, 80%, respectively, $p<0.001$) of microfilaremia. Adding albedazole to DEC did not increase adverse reactions to microfilarial death. Combination therapy using DEC/albendazole was no more efficacious for treating intestinal helminths than albendazole alone.
Conclusions: Co-administration of DEC/albendazole resulted in improved efficacy against microfilaria compared to DEC alone, but not against intestinal helminths compared to albendazole alone, unlike ivermectin/albendazole. Combination therapy with DEC/albendazole appears to be a viable alternative to ivermectin/albendazole for use in the lymphatic filariasis elimination effort in Asia and the Americas, where intestinal helminths co-exist and donated ivermectin is not available.

Treatment of Tuberculosis

P6. ***Janet L. Larson, I. Danilova, C. Caudill, L. Mitunina, P. Cegielski, K. Laserson, M. Urastova, N. Binkin, M. Stoyunin***
Factors Associated with Tuberculosis Treatment Interruption — Ivanovo, Russia, 1999

Background: The tuberculosis (TB) incidence in Russia more than doubled between 1991 and 1998, from 34/100,000 to 78/100,000. Despite the 1995 implementation of the World Health Organization's treatment strategy in Ivanovo, Russia, approximately 30% of patients have treatment failure, relapse or death. Previous studies suggested treatment interruption was a significant contributor to poor outcomes. Therefore, we studied factors for treatment interruption in Ivanovo to develop interventions for improving treatment success.
Methods: Patient and provider interviews were conducted in September 1999 to develop a questionnaire which was administered anonymously to TB patients registered from April through June 1999. Interruption was defined as missing $\geq$ one day of treatment. Data were analyzed using Epi Info and STATA.
Results: Preliminary data from 131 (59%) of 223 registered patients (51 inpatients, 20 outpatients and 60 patients who received both outpatient and inpatient treatment) showed that 16 (14%) of 111 inpatients and 22 (28%) of 80 outpatients interrupted treatment. Inpatient interruption was more common among men (relative

risk [RR]=5.6, 95% confidence interval [CI]=0.8–40.8) and illicit drug users (RR= 5.1, CI=2.0–13.0). Reasons for interruption included being tired of hospitalization (81%), inadequate food (38%), and needing to tend their subsistence farm (38%). Outpatient interruption was more common among men (RR=3.8, CI=1.0–14.9) and patients < 50 years old (RR=6.2, CI=0.9–43.0). Reasons included high transportation costs (23%), time required for clinic visit (27%), and needing to work (23%).

Conclusions: With modest additional resources, many factors influencing treatment interruption could be resolved. Potential solutions include providing adequate nutrition, inpatient activities, outpatient transportation, and home visits for patients unable to come in for treatment. These interventions may improve treatment outcomes.

P7. ***Elizabeth A. Talbot, Z. Taylor, K. Laserson, P. Simone, N. Binkin***
Prevention Effectiveness Study of Tuberculosis Treatment Strategies in a Setting with High Rates of Drug Resistance

Background: The World Health Organization (WHO) recommends standardized treatment without susceptibility testing for new tuberculosis (TB) patients. However, data suggest that this approach is less effective against multidrug-resistant TB (MDR-TB) and may contribute to the development of new resistance. In Ivanovo, Russia, where the WHO strategy was implemented in 1995, MDR-TB rates are among the highest in the world.

Methods: To determine the public health and economic impact of different diagnostic and treatment strategies in this setting, we performed a decision analysis for eight strategies for new, smear-positive pulmonary TB patients. Outcomes included 1) patients cured; 2) generation of new MDR-TB; and 3) costs. Probabilities of initial drug resistance were derived from Ivanovo data from 1995–1998, and outcomes were derived from international observational cohort studies and randomized controlled trials.

Results: We found that strategies using early rapid resistance detection and susceptibility testing or susceptibility testing alone to guide treatment result in more cures, fewer new MDR-TB cases, and lower costs than those that do not use these diagnostic testing strategies. For example, standardized treatment with rapid resistance and susceptibility testing to guide therapy in 1,000 patients results in 74.3% cure, generates 10 new MDR-TB cases, and costs $2,679 per patient, whereas the same regimen without diagnostic testing results in 65.8% cure, generates >21 new MDR-TB cases, and costs $3,086 per patient.

Conclusions:. The cost of strategies with diagnostic testing is less than those without testing because of costs incurred in treating patients who were not cured and treating those with newly-generated MDR-TB. Studies on the operational feasibility of strategies using diagnostic tests are needed in settings with high rates of MDR-TB.

P8. ***Philip R. Spradling, S. McLaughlin, D. Drociuk, S. Jones, R. Ridzon, C. Pozsik, I. Onorato***
Short-Course Treatment of M. Tuberculosis Infection in High-Risk Inmates — South Carolina

Background: CDC recently recommended treatment of latent tuberculosis infection (LTBI) for HIV-infected individuals with two months of rifabutin/pyrazinamide (2RZ). A benefit of short-course therapy is rapid treatment of patients at high risk who may be difficult to follow. In September 1999, following an outbreak at a prison dormitory for HIV-positive men, 225 men exposed to infectious tuberculosis (TB) received 2RZ.

Methods: To estimate differences in completion of treatment of LTBI using 2RZ versus 9-month isoniazid (9H), we compared actual outcomes of the cohort treated with 2RZ with projected outcomes if the same cohort had been treated with 9H. To ascertain the follow-up of exposed inmates released in the four months before detection of the outbreak, we reviewed state TB records.

Results: Of 225 men started on 2RZ, 43 discontinued due to adverse events or low drug levels. 162 men completed treatment while incarcerated and 20 were released before completion. Assuming the same rate of release (ten men per month) if the 225 men had been treated with 9H, 90 would have been released before completion and 135 would have completed while incarcerated. Use of 2RZ treated 27 additional men while incarcerated and left 70 fewer men for local health departments to locate and treat. Only 14/37 (38%) of exposed inmates released from the dorm before detection of the outbreak could be located by January 2000 and three already had TB disease.
Conclusion: Use of 2RZ in incarcerated populations may improve completion rates for treatment of LTBI, reducing demands on local health departments to locate and treat released inmates at high risk of developing TB disease in the community.

Prevention and Screening

P9. ***Silvia Terán, C. Walsh, L. Finelli, H. Chesson, K.L. Irwin, G. Wendel, P. Sánchez***
Cost-Effectiveness Analysis of Presumptive Treatment Regimens for Neonates Congenitally Exposed to Syphilis

Background: In 1988, CDC expanded the case definition for congenital syphilis because of complications associated with non-treatment. Treatment may be delayed or omitted because sensitive diagnostic tests do not exist for neonates congenitally exposed to syphilis without physical signs of disease. CDC STD Treatment Guidelines recommend 10 days of penicillin (intravenous or intramuscular) or a single dose of intramuscular penicillin for this group of neonates. We performed a cost-effectiveness analysis of these three regimens.
Methods: We analyzed data collected from 1989 through 1998 at Parkland Hospital, Dallas, from congenitally exposed neonates and their mothers. We evaluated infant weight, treatment given, cure rates based on serologic titers, and cost data for each treatment and diagnostic procedure. Data were analyzed with a decision analysis program, and expected values for costs and cure rates for each treatment were calculated. Data on frequency and costs of long-term complications were not available.
Results: Of 364 neonates congenitally exposed to syphilis without signs of disease, 2.7% were treated with 10 days of intravenous therapy, 7.1% with 10 days of intramuscular therapy, and 90.1% with single dose therapy. All regimens achieved 100% cure rates. The cost per case cured varied with weight but was lowest for all infants with single dose therapy ($382.74); the least cost-effective regimen was 10 day intramuscular therapy ($3023.80).
Conclusions: In this hospital, a single dose of intramuscular penicillin was the most cost-effective regimen for treating congenitally exposed neonates without signs of syphilis. Single dose therapy will likely decrease length of hospitalization and associated risks to these infants. Future cost-effectiveness evaluations of treatment regimens that consider other clinical settings and long-term complications of congenital exposure are warranted.

P10. ***Catherine A. McLean, K. Kohl, M. Baker, C. Ciesielski, J. Johnson, M. St. Louis, L. Markowitz***
Examining a Widely Used Tool in Syphilis Surveillance — Chicago, 1999

Background: Syphilis is a sexually transmitted disease that causes acute and chronic manifestations in adults. Perinatal transmission can result in congenital syphilis. In 1999, a plan for syphilis elimination in the U.S. was announced and includes laboratory-based surveillance as a critical component. Laboratories are required to report positive serologic tests for syphilis (STS). Since positive STS may represent past as well as active infection, health departments develop criteria based on sex, age, and serologic titer ("reactor grids") to exclude people from investigation. We evaluated the reactor grid used in Chicago, an area with high syphilis morbidity.

Methods: We reviewed all positive STS reported to Chicago Department of Public Health (CDPH) from Cook County Hospital, the largest public hospital in the U.S., during three months in 1999. We analyzed characteristics of persons excluded and evaluated.

Results: After application of the grid, 46% (167/358) of positive STS were excluded by CDPH, including 29% (51/174) from women and 63% (116/186) from men (OR=0.25, p<0.001). Of those excluded, 11% (19/167) had a syphilis titer $\geq$ 1:8. Of the 191 remaining, 117 (61%) had a history of treated syphilis and were not investigated, and 74 (39%) were referred for field investigation. Of these, 19% (14/74), or 4% of the total 358 positive STS, were newly identified cases of syphilis that were reported to CDC.

Conclusions: Persons reported to CDC as newly identified cases of syphilis represent only a small proportion of those with positive STS, especially among men. Reactor grids may help to efficiently allocate public health resources; however, they may result in under-reporting of syphilis cases. Reactor grids need to be evaluated as part of the syphilis elimination effort.

P11. ***David B. Callahan, M. Weinberg, R. Gunn***

Bacterial Vaginosis in Pregnancy: Diagnosis and Treatment Practices of Physicians in San Diego County, California

Background: Bacterial vaginosis (BV) is a common condition (10% – 20% prevalence in pregnant women in the United States) associated with preterm delivery and subsequent infant morbidity and mortality. Recent studies have indicated that treating symptomatic BV early in pregnancy (before intrauterine infection is established) can substantially decrease preterm birth; therefore, understanding how physicians manage BV in pregnancy is important for the development of interventions.

Methods: In March 1999, a survey was sent to all licensed obstetricians/gynecologists (n=197) and family physicians/general practitioners (n=419) in San Diego County.

Results: Surveys were completed by 253 physicians (response rate 41%), including 109 physicians who provided care to pregnant patients. Only 68% (74/109) of physicians caring for pregnant patients with symptoms of a vaginal infection always performed a wet mount slide examination (WMSE), the preferred diagnostic test for BV. However, physicians who believe that BV is a cause of preterm delivery were 50% more likely to perform WMSE compared to those who do not (79% [48/61] versus 54% [26/48], rate ratio = 1.5, 95% confidence interval = 1.1 – 1.9). Oral metronidazole or clindamycin, the preferred treatment for BV during all trimesters of pregnancy, was prescribed by 61% (67/109) of physicians for treating BV in pregnant patients. However, only 12% (8/67) of physicians prescribe them in the first trimester, when it is most effective.

Conclusions: In San Diego, more physicians need to be aware of the relation between symptomatic BV and preterm birth. Physicians should be encouraged to perform WMSE to diagnose BV, and to treat it with safe and effective regimens, including metronidazole, early in pregnancy.

P12. ***Kata L. Chillag, R. Gunn, K. Irwin, S. Harper, C. Akers, J. Fleming***
Evaluation of a Prevention Case Management Program for High-Risk STD Clinic Patients — San Diego, 1996–1999

Background: More than one million cases of gonorrhea and chlamydia are reported annually in the U.S., and can cause serious sequelae including infertility. Programs to reduce reinfection were developed because reinfection causes endemic transmission. We evaluated a case management program designed to reduce risky sexual behaviors and reinfection among patients with past gonorrhea or chlamydia infection attending a San Diego STD clinic.

Methods: Program elements include initial assessment, gonorrhea and chlamydia screening, and risk-reduction counseling. We analyzed data from patients eligible for the program, with a history of 1) ≥ two gonorrhea or chlamydia infections or 2) one such infection plus HIV infection or self-reported prostitution. We abstracted records for demographic and behavioral characteristics, reason for visit, and screening results. We calculated recruitment and retention rates and compared number of screening visits and infections in the year before and after enrollment.

Results: Of 107 eligible patients, most were male (73%), nonwhite (58%), and not HIV-infected (88%). Sixty-five (61%) had ≥ two gonorrhea or chlamydia infections. Of eligible patients, (40) 37% never returned; (29) 27% returned once, and (39) 36% returned more than once ("returnees"). The forty-eight (45%) who completed initial assessment were more likely to return more than once than those who did not ($p<0.05$). Sexual and care seeking data were inconsistently documented. Among the 39 returnees, mean number of screening visits increased after enrollment, [1.7 vs 1.0, ($p=0.09$)], while mean number of detected infections decreased, [0.3 vs. 1.6, ($p<0.05$)].

Conclusions: Recruitment and retention of patients in the program were low. Increased screening and decreased infection rates in returnees suggests that the program, if properly implemented, might have a positive impact. Staff should prioritize recruitment, retention, and documentation to enhance the program and enable future evaluation.

P13. ***Timothy S. Naimi, C. Gale, R. Besser, E. Belongia***
Antibiotic Use and Upper Respiratory Infections: Parental Knowledge and Beliefs — Minnesota and Wisconsin, 1999

Background: Among children, most antibiotics are prescribed for upper respiratory infections; more than one-third of these prescriptions are inappropriate. Because prior antibiotic use in children is a risk factor for subsequent antibiotic-resistant infections, ensuring appropriate antibiotic use is an important strategy for combating antibiotic-resistant infections.

Methods: To assess parental knowledge and beliefs that might influence antibiotic prescribing for upper respiratory infections, a statewide random-digit dialing procedure was used to survey a representative sample of Minnesota and Wisconsin households with a child <5 years old. Logistic regression models were used to identify factors associated with parental knowledge about appropriate antibiotic prescribing and with receipt of antibiotics.

Results: Eighty-six percent (236/275) of respondents were mothers. Among children with a clinic visit for a respiratory infection in the past 12 months, 76% (127/168) were prescribed an antibiotic, including 44% (26/59) of those who had non bacterial infection diagnoses; respondent satisfaction with medical care was not associated with antibiotic prescribing. In a multivariate model, antibiotic receipt was independently associated with having a bacterial infection diagnosis (adjusted odds ratio [AOR]=20.4; 95% confidence interval [CI]=6.4–65.7) and parental expectation that an antibiotic was needed (AOR=17.5; CI=5.3–57.3). Parental knowledge about appropriate antibiotic use was independently associated with female sex (AOR=3.8; CI=1.6–8.9), white race

(AOR=3.0, CI=1.2–7.6), exposure to ≥3 media or physician informational messages about antibiotic resistance (AOR=2.5; CI=1.0–6.1), and increasing age (AOR=1.1/year; CI=1.0–1.1).

Conclusions: Parental expectation of antibiotic treatment influences antibiotic prescribing but not satisfaction with medical care. Providing multiple and varied antibiotic-related informational messages to parents will likely increase their knowledge of antibiotic resistance and might decrease inappropriate antibiotic use.

P14. ***Amanda S. Brown, M. Cogswell, M. Gwinn, M.J. Khoury***

Hemochromatosis-Associated Morbidity in the United States: An Analysis of the National Hospital Discharge Survey (NHDS), 1997

Background: Hemochromatosis is a disorder of iron metabolism resulting in iron overload. Untreated people are at increased risk for serious diseases, including cirrhosis, congestive heart failure, and diabetes. Morbidity can be prevented through early diagnosis and therapeutic phlebotomy. The estimated prevalence of hemochromatosis is 50 to 80 cases per 10,000 people; however, it often goes undiagnosed, and its contribution to morbidity in the United States has not been well studied.

Methods: We used NHDS 1997 data as a source of population-based data for estimating hemochromatosis-associated morbidity. Each record in the NHDS includes up to seven diagnoses; we selected for analysis only those records listing the ICD-9-CM code for hemochromatosis (275.0). We excluded records for people under 25 years of age and for those with diagnoses suggesting secondary iron overload disorders (e.g., thalassemias). Each record is weighted for use in calculating national estimates.

Results: The rate of hospitalization associated with hemochromatosis was 2.0 per 10,000 hospitalizations. The mean age of people with a hemochromatosis diagnosis was 65 years (59 for men and 72 years for women); 90% were white, and 61% were men. The rate of hospitalization with hemochromatosis was 4.0 per 100,000 U.S. residents 25 years and older and 12.8 per 100,000 residents 65 years and older.

Conclusions: These data suggest considerable underreporting of hemochromatosis. It may be that many people with hemochromatosis never require hospitalization, that physicians are not diagnosing hemochromatosis, or both. Studies involving the newly recognized gene variants associated with hemochromatosis may increase our understanding of this disease and its natural history. Public health efforts should focus on increasing physician awareness of hemochromatosis and quantifying its impact on morbidity.

P15. ***Christine J. Benally, D. Perrotta, K. Condon***

Prostate Cancer Screening Among Males in Texas, 1997

Background: Prostate cancer is currently the second leading cause of death from cancer in Texas males. Screening for prostate cancer is controversial, with recommendations varying between national groups. We investigated the current extent of prostate cancer screening in Texas and looked at factors associated with screening.

Methods: We examined data from the Texas Behavior Risk Factor Surveillance System (BRFSS) in 1997. Analysis of data was restricted to males aged ≥40 years. Data were adjusted for nonresponse and weighted to provide statewide estimates. Confidence intervals (CI) were calculated by using SUDAAN.

Results: The BRFSS was administered to 492 men aged ≥40 years in 1997. Sixty percent (95% CI: 55%–65%) of the men responding said that they had heard of the Prostate Specific Antigen (PSA) blood test. Of these men, 52% (95% CI: 45%–69%) were told by a doctor to have the PSA blood test. Of the men told to be tested, 54% (95% CI: 48%–56%) had the test done. Overall, 37% (95% CI: 32%–42%) of men ≥40 years of age had received the PSA blood test. Men whose blood relatives had prostate cancer were 2.1 times (95% CI: 0.8%–5.5%) more likely to be tested. On univariate analysis, age, race, marital status, income, education, and insurance were not associated with receipt of PSA testing.

Conclusions: Although not currently recommended by the United States Public Health Service, prostate cancer screening is common among older males in Texas. Patients and physicians should be better educated about the appropriateness of routine screening for prostate cancer.

P16. ***Christopher M. Zimmerman, J. Bresee, U. Parashar, T. Riggs, R. Holman, R. Glass***
Cost of Diarrhea-Associated Hospitalizations and Outpatient Visits in an Insured Population of Children — United States, 1993–1996

Background: Rotavirus is the most common cause of gastroenteritis in young children in the United States. Although the first licensed rotavirus vaccine was withdrawn from the market, new vaccines for rotavirus are under development. Current information on disease and financial burden associated with rotavirus infection are needed to assess the costs and benefits of these candidate rotavirus vaccines.
Methods: During 1993–1996, we analyzed a medical claims database compiled from 65 large manufacturing firms which insure approximately 300,000 children aged <5 annually. We examined costs and trends in diarrhea-associated hospitalizations and outpatient visits using International Classification of Diseases 9th edition Clinical Modification (ICD-9-CM) diagnostic codes for diarrhea and rotavirus.
Results: An annual average of 1,186 diarrhea-associated hospitalizations (35 per 10,000 children) and 33,386 outpatient visits (943 per 10,000 children) were reported, accounting for 4% of all hospitalizations and 2% of all outpatient visits among children < 5 years. Six diarrhea-associated deaths were identified; two had only diagnostic codes for diarrhea or dehydration listed. The median cost of a diarrhea-associated hospitalization was equal to that of a rotavirus coded hospitalization ($2,300 in constant 1998 dollars). Rotavirus-coded outpatient visits had a higher median cost than other diarrhea-associated outpatient visits ($57 versus $47, respectively, p=<0.01).
Conclusions: This study is the largest to estimate diarrhea-associated outpatient costs and disease burden. Although not a nationally representative population, rates of diarrhea-associated hospitalizations were consistent with other studies. Large administrative databases are robust sources of information to assess costs and disease burden and will be useful in determining the cost-effectiveness of future rotavirus vaccines.

Wednesday Afternoon — April 11, 2000

1:45 Maternal and Child Health. Moderator: Diane L. Rowley

1:50 ***Cassius T. Lockett, B. Zhu, A. Rafferty, M. Reeves***
Knowledge and Use of Folate Among Women of Reproductive Age — Michigan, 1998

Background: Of the 4000 pregnancies that result in neural tube defects (NTDs) in the United States annually, 50%–70% could be prevented by adequate folate intake during the periconceptional period. Information on the knowledge and behaviors of women of reproductive age regarding folate consumption is essential to implement programs and to design strategies that increase folate awareness and use.
Methods: The 1998 Michigan Behavioral Risk Factor Survey asked 742 women aged 18–44 years about their folate-related knowledge (i.e., whether they knew that folate can prevent NTDs) and behavior (i.e., at least daily consumption of folate-containing multivitamins). We used multivariable logistic regression to identify factors associated with knowledge and behaviors regarding folate.
Results: Overall, 47% of the respondents took folate-containing multivitamins, of which 88% took them daily. Women < age 24 years (OR=1.8, 95% CI: 1.1–3.3) women with < high school education (OR=3.0, 95%

CI: 1.3–6.8) and women who ate <five fruits or vegetables daily (OR=1.6, 95% CI: 1.1–2.4) were less likely to take a multivitamin.
Unmarried women (OR=1.7, 95% CI: 1.1–2.7) and current smokers (OR=2.0, 95% CI: 1.1–3.7) were less likely to know about the benefits of folate.
Conclusions: Multivitamin intake and folate knowledge are related to education, dietary habits, marital status and smoking. Public education campaigns to promote this inexpensive and effective nutritional supplement should be targeted toward women who are unmarried, overweight, smoke, have low education, and poor dietary habits.

2:10 *Meredith A. Reynolds, L. Schieve, G. Jeng, L. Wilcox*
Multiple-Birth Risk Among Women Using In Vitro Fertilization With Donor Eggs

Background: To maximize their chances of birth, many women undergoing in vitro fertilization (IVF) transfer more than one embryo. This practice is associated with multiple-births and attendant elevated infant morbidity and mortality. Carrying multiple fetuses also increases maternal complications. Previous studies showed that the multiple-birth risk declined with age among women using their own eggs for IVF. However, this age effect may not apply to women using embryos from eggs donated by younger women.
Methods: A U.S. population-based dataset of IVF procedures initiated in 1996 and 1997 was used to investigate the association between number of embryos transferred and multiple-births among women aged 35 – 54 years who used donor eggs (n = 7,983).
Results: Overall, 3,178 (40%) IVF procedures resulted in a live-birth delivery; of which 43% were multiple-births. Number of embryos transferred was associated with multiple-birth risk (24% vs. 42%) when 2 or 3 embryos were transferred respectively ($p < .001$). Age was not associated with multiple-birth risk (48%, 38%, 38%, and 44% among women aged 35 – 39, 40 – 44, and 45 – 49, and 50 – 54 years respectively with 3 embryos transferred; $p > .05$). These multiple-birth rates were much higher than previously published rates among women using their own eggs who transferred 3 embryos (29% and 11% for women aged 35 – 39 years and 40 – 44 years, respectively).
Conclusions: Multiple-birth rates associated with transferring multiple-embryos for women aged 35 years and older using donor eggs are substantially higher than those for similarly aged women using their own eggs. Thus, decisions about number of embryos to transfer during IVF need to be based on the age of the woman providing the eggs, rather than the patient's age.

2:30 *Willie J. Parker, V. Hogan, G. Chavez, D. Taylor, L. England*
State-Specific Differences in Singleton Preterm Delivery Among Black and White Women — United States, 1990 and 1996

Background: National infant mortality rates for non-Hispanic black women (blacks) are double that of non-Hispanic white women (whites). Nearly 2/3 of this disparity is attributed to a higher rate of singleton preterm delivery (PTD) to blacks. Causes of singleton PTD disparity between blacks and whites are poorly understood. We analyzed changes in PTD rates for these two groups on a state-by-state basis for 1990 and 1996.
Methods: National birth certificate data for all singleton births were analyzed. Maternal race and ethnicity were self-reported on the infant birth certificate. The PTD rate, births at 17 weeks –36 weeks gestation per 1000 live births, was determined for states for years 1990 and 1996. States with < 20 preterm births for either blacks or whites were not included. PTD rate ratios of blacks to whites were determined as a measure of disparity.
Results: In 1990, black-white (B-W) PTD rate ratios were >2.0 in 33 out of 41 states and Washington, DC (DC). That number decreased to 12 states by 1996. The B-W rate ratio decreased in 29 states due to increases

in preterm births to whites during decreases among blacks. It decreased in 2 states and DC following decreased PTD to both blacks and whites, and decreased in 6 states despite increases in PTD rates for both groups. The PTD rate ratio between blacks and white increased in four states between 1990 and 1996.
Conclusion: The disparity in preterm delivery is narrowing between blacks and whites. In several states, these changes are attributed to declines in PTD among blacks. In other states, however, reduction in the disparity results from increases in the preterm delivery rate among whites.

2:50 ***Julia L. Samuelson, J. Buehler***
Components of Excess Mortality for Black Infants in Georgia, 1994–1996

Background: In 1997, the infant mortality rate (IMR) for black infants in Georgia was more than twice that of white infants. A 1998 Presidential Initiative to reduce racial and ethnic disparities in health included infant mortality as a key target area. Our objective was to assess the components of excess deaths for black infants.

Methods: Linked birth and infant death records were used to identify births to Georgia residents during 1994-1996. We determined excess mortality in two ways. First, we compared the IMR between black and white infants. Second, we examined differences among black infants using a reference group with a low IMR based on maternal education, age and place of residence. Excess deaths were separated into those due to differences in birthweight distributions and differences in birthweight-specific mortality rates by age at death.
Results: The IMR for white infants was 6.0/1,000 live births, compared with 14.4 for black infants. Seventy-seven percent of this excess was due to differences in birthweight distributions, primarily reflecting a higher proportion of black infants weighing <1,500 g. The IMR for the black reference group was 11.2/1,000, compared with 15.3 for all other black infants. Seventy-three percent of this excess was due to birthweight-specific mortality rate differences, primarily reflecting a gap in neonatal mortality rates among infants weighing 500-2,499 g.
Conclusions: Within-race analyses can complement between-race analyses. Findings from both perspectives are useful to identify potential interventions that may reduce deaths among black infants. Although prevention of low birthweight remains important for closing the black-white gap, more immediate reductions in mortality among black infants could be achieved by assuring consistent access to appropriate perinatal care.

3:10 ***Juan M. Acuna, P. Yoon, S. Rasmussen***
Developmental Dysplasia of the Hip: A Population-Based Study of Risk Factors — Metropolitan Atlanta, 1968–1997

Background: Congenital developmental dysplasia of the hip (DDH) encompasses different degrees of abnormal development of the hip joint, with the estimated number of U.S. cases ranging from 2,000 to more than 10,000 per year. Diagnosis and intervention before the fourth month of life is associated with less life-long disability. This study evaluates risk factors for DDH in order to increase our understanding of the condition, which may contribute to earlier diagnosis.
Methods: We conducted a cohort study using data from the Metropolitan Atlanta Congenital Defects Program, an active surveillance system for birth defects, and data from vital records for the same population. We identified DDH cases over a 30-year period (1968–1997) and classified them as either isolated or as associated with other major defects or syndromes. We restricted our detailed analysis to the first group because the second group represents different clinical entities.
Results: Of the 762 cases of DDH that we identified, we classified 592 (77.7%) as isolated. The prevalence of isolated DDH was 0.59/1000 live births. Risk factors for isolated DDH included female sex (relative risk [RR] = 4.0, 95% confidence interval [CI] = 3.2–4.9), maternal primigravida status (RR = 1.8, 95% CI = 1.5–2),

birth weight more than 3500 gm (RR = 1.5, 95% CI = 1.3–1.8), and maternal age younger than 25 years (RR = 2.7, 95% CI = 1.3–5.3). Of the isolated cases, 352 (59.4%) were unilateral, and of these, 276 (78.4%) (95% CI = 73.7–82.5%) involved the left hip.

Conclusions: Laterality is a new finding that may give insights into the causes of DDH such as differences in morphogenesis and hip biomechanics. The identification of new risk factors may help clinicians diagnose cases earlier in order to prevent disability.

Thursday Morning — April 13, 2000

8:30 Environmental and Occupational Health. Moderator: Carol H. Rubin

8:35 *Mary P. Naughton, R. Kaiser, A. Henderson, J. Wilhelm, S. Kieszak, L. Backer, C. Rubin*
The Hot Zone Revisited — Chicago, Illinois, 1999

Background: On July 30,1999, Chicago's heat index reached 44° Celsius (114° F). One day earlier, Chicago began the first extensive implementation of its Extreme Weather Operations Plan (EWOP), which was based on recommendations from CDC's investigation of Chicago's 1995 heat wave. From July 29 through August 6, 1999, the coroner reported 80 heat-related deaths. Heat-related mortality is preventable; we conducted a study to identify risk factors for these deaths, assess the EWOP, and identify remaining vulnerable groups.

Methods: We conducted a case-control study, obtaining information from surrogates for the deceased (n = 64) and from age- and neighborhood-matched controls. We used standardized questionnaires to obtain descriptive and risk factor data, and performed a matched analysis.

Results: Of the 80 decedents, 46% were < 65 years old, 53% were white, 3% were Hispanic, and 49% were female. Four risk factors identified in the matched univariate analysis were living alone (Odds Ratio [OR] = 5.6, 95% Confidence Interval [CI] = 1.9–22.9), psychiatric illness (OR = 5.5, 95% CI = 1.8–22.4), top floor residence (OR = 4.7, 95% CI = 1.8–14.1), and annual income < $10,000 (OR = 4.5, 95% CI = 1.6–15.4). A working air-conditioner was protective (OR = 0.12, 95% CI = 0.03–0.33); a working fan was not (OR = 1.4, 95% CI = 0.38–5.7). Of controls, 90% were aware of the heat warning issued by Chicago, 95% knew the dangers of heat, and 95% learned of these dangers through television.

Conclusions: Living alone, psychiatric illness, top-floor residence, and low income are significant risk factors for heat-related death. A working air-conditioner remains protective; a working fan is not. Based on this investigation, the EWOP will be modified to enhance outreach to high-risk groups, including residents of top floors and the poor.

8:55 *Reinhard Kaiser, C. Rubin, A. Henderson, M. Wolfe, C.L. Parrott, M. Adcock*
Mental Problems as a Risk Factor for Heat-related Death — Cincinnati, Ohio, 1999

Background: Up to 1,700 heat-related deaths have occurred in the United States in a year with a heat wave. Heat-related deaths are preventable, and many cities have developed heat plans as a proactive public health approach. Cincinnati, Ohio, has had a heat plan since the 1980s. Although no heat-related deaths had been reported in Cincinnati since 1988, 18 occurred during a heat wave in July 1999.

Methods: We evaluated the city's response to the heat wave; reviewed death investigation reports, including extensive toxicological screens; and conducted a case-control study. Control subjects were matched for age and neighborhood. We interviewed 17 case surrogates and 34 control subjects for risk factors for heat-related death and for prevention behaviors. We used exact conditional regression for analysis.

Results: Death investigation reports showed that all victims had known risk factors for heat-related death. More significantly, eight had mental problems; among these, five were younger than 65 years, and four took psychotropic medication that can affect thermoregulation. Of the decedents with mental problems, three lived in group homes or halfway residences, four lived alone, and one lived with an elderly aunt. In the case-control study, a working air-conditioner at home was the strongest protective factor (odds ratio = 0.03, 95% confidence interval = 0–0.2) and was the only significant variable in the multivariate model.

Conclusions: We identified young people with mental problems as a new high-risk group that was not addressed in Cincinnati's heat plan. Caretakers of people with mental problems should be trained to evaluate heat-related risks and recognize signs of heat-related morbidity. Air-conditioning is an effective prevention tool; regulations to limit maximum temperatures should be considered for assisted-care facilities.

9:15 ***Marc G. Weisskopf, H. Anderson, L. Hanrahan, T. Török, P. Rumm***

Factors Contributing to Reduced Heatwave-Associated Mortality — Milwaukee, Wisconsin, 1995 Versus 1999

Background: More persons in the United States are killed each year by excessive heat than lightning, hurricanes, tornadoes, floods and earthquakes combined. During heatwaves mortality can be substantially increased. Heatwaves during 1995 and 1999 led to 91 and 11 deaths, respectively, in Milwaukee while other years since 1991 averaged one. We examined whether temperatures alone could account for the reduced heat-related mortality in 1999. Alternatively, outreach to at-risk groups initiated after 1995 and heat advisories issued before the major heatwave in 1999 might have contributed to this reduction.

Methods: Heat-related deaths were determined by the coroner's office in Milwaukee. Heat advisory days (HAD) were defined as days with heat indices (HI) during 3 consecutive hours >40.5C (105F) and night HI averages >26.7C (80F). Standardized mortality ratios (SMR) adjusted for age and temperature were calculated using indirect standardization.

Results: The SMRs for heat-related deaths in 1999, calculated with adjustment for maximum HI levels or total HI average during HAD, were .20 (95% confidence interval (CI)=.10–.39) and .18 (95% CI=0.09–0.35), respectively. If adjustment is made for the square of these HI variables, the SMRs were still significantly ($p<.05$) less than 1. However, the SMR calculated with adjustment for the square of nighttime averages during the heatwave was 1.27 (95% CI=0.50–3.22).

Conclusion: The reduced heat-related mortality in Milwaukee in 1999 compared with 1995 likely resulted from some combination of three factors: outreach to at-risk groups initiated after 1995, increased awareness resulting from additional heat advisories issued before the major heatwave in 1999, or lower nighttime HIs. These factors should be investigated in other heatwaves. Nonetheless, the data suggest that heatwave prevention messages be targeted to nighttime risk behaviors.

9:35 ***Joshua A. Mott, P. Meyer, D. Mannino, C. Schaben, S. Redd***
Health Effects Associated with Forest Fires — Hoopa, California, August–October, 1999

Background: Forest fires in Northern California burned from August 23 through October 23, 1999 near the Hoopa Valley Indian Reservation. Resulting levels of ambient particulate matter (PM10) reached 721 $\mu g/m^3$, well above EPA's regulatory level of 150 $\mu g/m^3$, prompting a CDC investigation. The high frequency of forest fires and the absence of information on the health effects of extreme smoke exposures on the general population underscored the importance of this investigation.
Methods: We interviewed 288 area residents: 76 "susceptibles" (those with pre-existing cardiopulmonary conditions) and 212 randomly selected "nonsusceptibles" (those without). We examined changes in the frequency and severity of pulmonary (asthma, breathing difficulty, chest pain, and coughing) and irritative (headache, sore throat, nausea, nasal irritation, eye irritation and allergies) symptoms from before-to-during and before-to-after the heavy smoke using Wilcoxon and χ^2 tests for trends.
Results: Most participants reported an increase in symptom frequency during the fires (82% irritative; 64% pulmonary). Susceptible participants reported an increase in the severity of more pulmonary symptoms (Wilcoxon $Z=2.56$; $p=.01$), but not irritative symptoms, than nonsusceptible participants. Two weeks after the fires, susceptible ($Z=1.65$; $p<.1$) and older (χ^2-trend $= 4.98$; $p<.05$) participants continued to report increased severity of pulmonary symptoms. Those who worked outside ($Z=-2.26$; $p<.05$) and who lived in homes needing repair ($Z=2.79$; $p<.01$) also reported an increased frequency of post-fire pulmonary symptoms. People who heeded messages to stay indoors reported fewer residual pulmonary symptoms ($Z=-2.32$; $p<.05$).
Conclusions: Heavy smoke produces considerable health effects in susceptible and nonsusceptible populations. However, staying in well-maintained homes appeared to be an effective method to reduce the number of symptoms experienced.

9:55 ***Helga S. Daftarian, K. Roegner, C. Reh, C. Mueller, D. Lewis, T. Bledsoe***
Evaluation of Occupational Asthma Among Workers Exposed to Toluene Diisocyanate (TDI) at a Flexible Foam Manufacturing Facility

Background: Toluene diisocyanate (TDI) is a chemical used in polyurethane foam manufacturing. Approximately 50,000–100,000 U.S. workers are exposed to TDI and related compounds that are well-recognized sensitizers and are responsible for occupational asthma in 5–15% of exposed workers. With its increasing use and serious health effects, TDI represents a significant public health concern in the workplace. The purpose of this study was to examine the relationship between TDI exposure and occupational asthma.
Methods: We conducted a cross-sectional study of workers at a foam manufacturing plant. Participants completed a questionnaire, provided serial peak flow (PF) measurements, and provided serum for antibody testing. Personal air monitoring for TDI was also conducted. A case of asthma was defined as the occurrence of wheezing, plus one of the following: shortness of breath, chest tightness, or cough.
Results: 114 (39%) of 290 employees participated. Twenty-two percent (25/114) met the case definition for asthma. Elevated prevalence rate ratios (PRRs) were found for TDI-related production work (PRR=3.40; 95% CI 0.92–39.52) and hourly line work (PRR=2.15; 95% CI 0.52–24.46). Employment duration, TDI air levels, and TDI-specific IgG and IgE were not associated with asthma. Of 65 persons providing peak flow measurements, 8 showed patterns consistent with occupational asthma.
Conclusion: A number of employees met our definition for asthma; however, asthma occurrence could not be specifically related to occupational TDI exposure. The low participation rate and small number of cases precluded a more definitive analysis. Based on our findings and the established health effects of TDI, recommendations were made to plant management to enhance current controls to further reduce TDI exposure and minimize the risk for occupational asthma in this workforce.

10:35 Sexually-Transmitted Diseases. Moderator: Helene D. Gayle

10:40 ***Sally A. Slavinski, S. Hader, J. Winston, A. Rausa, R. Hotchkiss, C. Thompson, A. Greenberg, S. Holmberg***

A Cluster of HIV-Infected Adolescent Females in Rural Mississippi, 1999

Background: The rate of heterosexually transmitted human immunodeficiency virus (HIV) infection is increasing among African Americans, particularly in the South. Mississippi has one of the highest sexually transmitted disease (STD) rates and the highest teen birthrate in the United States. We investigated a cluster of HIV-infected adolescent females in rural Mississippi to identify risk factors for infection and opportunities for secondary prevention.

Methods: We interviewed HIV-infected persons and their uninfected sex contacts. HIV-infected persons were tested for CD4+ T-lymphocyte cell counts and plasma HIV-1 RNA levels.

Results: The cluster consisted of 7 HIV-infected persons (5 females) and 22 uninfected sex contacts (10 females); all were African American. All persons denied injecting drug use. The two HIV-infected males were aged 24 and 26 years. The HIV-infected females were younger (median=16 years, range: 13–17) than the uninfected females (median=20.5 years, range: 15–27); began having sex at a younger age (median=13 years, range: 11–14 versus median=15 years, range: 12–17); and had more lifetime sex partners (median=18, range: 7–40 versus median=6, range: 1–90). HIV-infected females preferred sex partners older than themselves (60% versus 10% of uninfected females) and were more likely to have had an STD (80% versus 40%). Five of the HIV-infected persons had not sought medical care and were provided an appointment with a local physician. Based on laboratory results, antiretroviral therapy was indicated for all HIV-infected persons.

Conclusions: History of STDs and sexual behavior contributed to this cluster of heterosexually-acquired HIV among African American adolescent females in rural Mississippi. Changing sexual practices and improving access to health care are needed to curb the emergence of HIV in this setting.

11:00 ***Janet M. Blair, P. Fleming, J. Karon***

Trends in Acquired Immunodeficiency Syndrome (AIDS) Incidence and Survival in the Treatment Era Among Men of Color Who Have Sex With Men, United States

Background: AIDS incidence in the United States declined 30% among men who have sex with men (MSM) from 1996 to 1998, when highly effective therapies were introduced; deaths declined 61%. Trends in racial/ethnic differences in AIDS incidence and survival may identify unmet needs for health care among MSM.

Methods: We studied MSM ≥13 years old diagnosed with AIDS from 1993 through 1998. We used the Kaplan-Meier method to estimate survival following an AIDS-opportunistic illness (AIDS-OI) diagnosis.

Results: From 1993 through 1998, 166,977 MSM were diagnosed with AIDS. The proportion who were MSM of color [defined as black, Hispanic, Asian/Pacific Islander (API), American Indian/Alaska Native (AI/AN)] increased from 39% in 1993 to 52% in 1998. From 1996 to 1998, AIDS incidence declined 23% among black MSM (from 66.2 to 50.7 per 100,000), 26% among Hispanic MSM (from 39.3 to 29.0), 34% among AI/AN MSM (from 11.2 to 7.4), 39% among white MSM (from 17.9 to 11.0), and 43% among API MSM (from 9.1 to 5.2). From 1996 to 1998, AIDS deaths declined 53% among black MSM, 60% among Hispanic MSM, and 62–69% among each of the other racial/ethnic groups of MSM. Among white MSM diagnosed with an AIDS-OI, the proportion surviving ≥18 months increased from 61% in 1993 to 82% in 1997; among black MSM from 60% to 78%, and among Hispanic MSM, 61% to 83%.

Conclusions: Among MSM, black and Hispanic men account for an increasing proportion of AIDS cases and have had the smallest declines in AIDS incidence and deaths. Increased efforts should be made to promote HIV prevention and treatment services in communities of color to reduce morbidity and improve survival.

11:20 ***Suzanne M. Cotter, S. Sansom, B.H. Lee, T. Long, S. de Fijter, F. Smith, S. Kellerman, F. Averhoff, B. Bell***

Risk Factors for Hepatitis A Among Men Who Have Sex with Men — Ohio, 1998–1999

Background: Periodic hepatitis A outbreaks occur among men who have sex with men (MSM). Since 1996, hepatitis A vaccination of MSM has been recommended, but few MSM are vaccinated. During a hepatitis A outbreak between November 1, 1998 and May 31, 1999, involving 135 predominantly MSM cases, we investigated risk factors for infection among MSM and potential opportunities for vaccination.

Methods: Case-patients were self-identified MSM with serologically confirmed hepatitis A, available for re-interview. Control-subjects, self-identified MSM who were susceptible to hepatitis A, were recruited from social settings and frequency-matched to case-patients by age group and referent exposure period. Study participants were interviewed regarding risk factors, access to health care, and attitudes regarding hepatitis A vaccination.

Results: The 47 case-patients and 69 control-subjects were similar with respect to age, race, education, and annual income. Contact with a hepatitis A case (6 [13%] cases, 1 [1%] control; odds ratio [OR]: 10.0; 95% confidence interval [CI]: 1.1–231.2) was the only factor associated with illness. Similar proportions of case-patients (28%) and control-subjects (36%) reported $\geq$ 2 sex partners during the incubation period; neither number of sex partners nor any sex practice was associated with illness. Among control-subjects, 52 (75%) saw a health-care provider at least annually, 60 (87%) had health insurance, and 56 (81%) reported willingness to be vaccinated.

Conclusions: In this setting, hepatitis A among MSM was not associated with high-risk sexual practices or other modifiable behaviors. HCP offices represent potential opportunities for hepatitis A vaccination of MSM. Increased educational efforts among MSM and HCPs regarding the importance of hepatitis A vaccination are needed.

11:40 ***Wolfgang Hladik, S. Dollard, P. Kataaha, J. Karon, P. Pellett, H. Namaala, R. Downing, J. Goddard, B. Biryahwaho, C. Pau, E. Lackritz***

Human Herpesvirus 8 Infection Among Voluntary Blood Donors — Uganda, 1999

Background: Human herpesvirus 8 (HHV-8) is the probable etiologic agent for Kaposi's sarcoma, the leading malignancy in Uganda. HHV-8 seems to be sexually transmitted in industrialized countries, but transmission modes in Africa are unknown.

Methods: To assess risk factors for HHV-8 infection, we evaluated 3,736 serum specimens collected during November 1998 – May 1999 from blood donors in Kampala, Uganda. For HHV-8 testing, we selected specimens of all 203 donors positive for human immunodeficiency virus (HIV), hepatitis B surface antigen (HBsAg), or syphilis, and 198 randomly from the remaining nonreactive specimens. Specimens were tested by two HHV-8 enzyme-linked immunosorbent assays (orfK8.1 and orf65) and one immunofluorescence assay. Specimens reactive to at least two of the three tests were classified as positive. Prevalence estimates account for the probability that a sample was analyzed. We used a Z-test to evaluate differences in HHV-8 prevalences.

Results: The estimated HHV-8 prevalence was 25.6% (95% confidence interval = 19.9% – 31.2%). HHV-8 prevalence was not associated with gender and there was no trend for age (range 15 – 60 years). HHV-8 prevalence was higher among HbsAg-positive donors than for HbsAg-negative donors (38.2% versus 25.1%,

respectively, weighted logistic regression [WLR], p = 0.01) and was higher among HIV-positive than HIV-negative donors (39.4% versus 25.3%, WLR, p = 0.03).
Conclusion: HHV-8 prevalence in Uganda was more than 10 times higher than that of U.S. blood donors. Prevalence peaked by the age of sexual activity and was associated with hepatitis B infection, both suggesting that the primary route of transmission is not sexual. However, HHV-8 was associated with HIV infection, indicating that sexual transmission may also be occurring.

Thursday Afternoon — April 13, 2000

12:30 Poster Session No. 2 — Meet the Authors
(See Wednesday schedule for list of presentations)

1:30 Vaccine Eradicable Diseases–Measles and Poliomyelitis.
Moderator: Stephen L. Cochi

1:35 *Fabio Lievano, M. Papania, R. Helfand, P. Rota, R. Harpaz, W. Bellini*
No Evidence of Measles Virus Shedding in People with Inapparent Measles Infections

Background: Measles control strategies assume that classic measles is clinically recognizable and highly contagious. However, in studies of people exposed to measles virus, serological evidence of infection has been detected in up to 33% of those without the clinically recognizable disease. Because transmission from people with inapparent infections might complicate measles eradication, we attempted to detect measles virus or serologic evidence of infection in specimens from exposed people without classical measles to determine if non-classical infections could be infectious.
Methods: During measles outbreaks in Alaska and Arizona in 1998, throat swabs, lymphocytes, serum and urine samples were collected from healthy contacts exposed to confirmed measles cases. Specimens were collected 12–16 days after exposure (when a person with classical measles is most infectious). Convalescent sera were drawn two weeks later. All sera were tested for measles IgM antibody using ELISA. Plaque reduction neutralization (PRN) titers were measured from acute and convalescent sera. Virus isolation and reverse transcriptase polymerase chain reaction (RT-PCR) testing was attempted for all samples.
Results: Of the 133 contacts in the study, 9 (7%) were positive for measles IgM antibody. Two other contacts had four-fold increase in neutralizing antibody. All viral cultures were negative. RT-PCR from a throat swab of one contact without serologic evidence of infection was positive. However, the nucleotide sequence obtained was not consistent with the genotype associated with the outbreak, suggesting the result was due to a laboratory artifact.
Conclusions: Absence of measles virus from multiple respiratory specimens by culture and PCR indicates that transmission of measles virus from people with inapparent infections is not epidemiologically important and is unlikely to be an impediment to measles eradication.

1:55 *Amra Uzicanin, P. Strebel, E. Webb, U. Matai, R. Eggers, R. Sutter*
Impact of Measles Supplemental Vaccination Campaigns — South Africa, 1996–1997

Background: South Africa has the goal of indigenous measles elimination by 2002. Supplemental measles vaccination campaigns were conducted nationwide in 1996–97, targeting all children aged 9 months–14 years; coverage was estimated at 85%. To evaluate progress made toward measles elimination, the campaign impact

was evaluated in two provinces. In Mpumalanga, the campaign was conducted in 1996, with an estimated coverage of 94%. In Western Cape two campaigns were conducted: children aged 9 months–5 years were targeted in 1996, and children aged 5–14 years in 1997; overall coverage was estimated at 93%.

Methods: Measles surveillance data for 1992–98 were reviewed. Admission books for 1992–1999 were reviewed in 52 hospitals, representing 82% and 94% of total bed capacity in public sector in Mpumalanga and Western Cape, respectively. The information obtained on patients diagnosed with measles on admission and/or discharge included basic demographics, dates of hospitalization and discharge, and outcome.

Results: In Mpumalanga, 4,679 measles cases and six deaths were reported in 1992–1998, with 188 (4%) cases and no deaths reported in 1997–98. We identified 1,647 measles hospitalizations and 11 deaths in the pre-campaign period, compared to 57 hospitalizations and no deaths post-campaign. In Western Cape, 5,217 measles cases and 19 deaths were reported in 1992–98; of these, 72(1%) cases and no deaths were reported in 1998. We identified 736 measles hospitalizations and 23 deaths in the pre-campaign period, compared to 20 measles hospitalizations and no deaths post-campaign.

Conclusion: Measles disease burden, notably deaths and hospitalizations, was considerably reduced in both provinces post-campaign, compared to the pre-campaign period. Longer observation and/or mathematical modeling is needed to estimate the long-term impact of the campaigns.

2:15 *Dawn E. Raymond, R. Jiles, Z. Zhao, P. Smith*
Measles-Containing Vaccine (MCV) Coverage Among Preschool Children in Seven Selected United States Cities, 1996–1998

Background: Despite international measles eradication initiatives, global reported coverage with one dose of MCV declined from 79% in 1997 to 72% in 1998. In 1989–1990, seven major cities (Chicago, Dallas, Houston, Los Angeles, Milwaukee, New York and San Diego) experienced measles outbreaks among preschool children. This study examined MCV coverage in these seven cities in order to assess their potential for future measles outbreaks.

Methods: Immunization coverage estimates for 1996 through 1998 were calculated for seven cities, a total of 5,193 children, using data from the National Immunization Survey (NIS), a population-based telephone household survey followed by a mailed provider validation study. The NIS, conducted in all 50 states and 28 US cities, yields estimates of vaccine coverage among children 19–35 months of age.

Results: There were no statistically significant declines in the percentage of children receiving at least one dose of MCV within any of the seven cities between 1996 and 1998. However, two cities had continuous declines from 1996 through 1998: Chicago from 88.7% (95% CI ± 4.7) to 87.2 (95% CI ± 5.1) to 86.4% (95% CI ± 5.5), and Dallas from 91.6% (95% CI ± 3.9) to 88.5 (95% CI ± 4.6) to 86.5% (95% CI ± 5.0).

Conclusions: Three years of data did not provide adequate statistical power to draw specific conclusions about the significance of declining coverage. However, two major cities with declining coverage is concerning and may suggest declining trends, and increasing potential for measles outbreaks. In light of measles eradication efforts, continual surveillance reporting is necessary to effectively monitor MCV coverage and sound early alarms to identify children most at risk for measles.

2:35 *Kathryn A. Kohler, K. Banerjee, G. Hlady, R. Sutter*
Risk of Vaccine-associated Paralytic Poliomyelitis — India, 1998

Background: Vaccine-associated paralytic poliomyelitis (VAPP) is a rare but serious consequence of oral poliovirus vaccine (OPV) administration. Intensified OPV administration has reduced wild poliovirus transmission in India; however, as polio eradication is progressing, VAPP is emerging as a concern. We used

India's acute flaccid paralysis (AFP) surveillance data to estimate VAPP risk in a tropical, developing, polio-endemic country where OPV is distributed both via routine immunization and national immunization days.
Methods: Recipient (contact) VAPP cases were AFP cases with residual weakness 60 days after paralysis onset, isolation of vaccine-related poliovirus, no wild poliovirus isolated, and paralysis onset 4–40 (<4 or > 40) days following OPV receipt. The birth cohort was used as the denominator for first-dose VAPP risk, the total estimated number of OPV doses administered as the denominator for overall recipient and contact VAPP risk, and the total OPV doses administered minus the birth cohort for subsequent-dose recipient VAPP risk.
Results: We identified 85 VAPP cases (23 recipient, 62 contact) with paralysis onset in 1998. Contact and recipient VAPP cases were similar clinically but contact cases were older (medians 709 vs. 360 days, respectively). Overall estimated VAPP risk was 1 case/3.4 million OPV doses administered. Recipient VAPP risk was 1 case/12.6 million, contact VAPP risk was 1 case/4.7 million, first-dose recipient VAPP risk was 1 case/3.6 million, and subsequent-dose recipient VAPP risk was 1 case/16.6 million.
Conclusions: Despite multiple OPV doses given to children via mass immunization campaigns, estimated VAPP risk in India, based on data from a highly sensitive surveillance system, is consistent with other countries. Eradication efforts must be accelerated to eliminate all poliomyelitis cases whether caused by wild or vaccine-derived poliovirus.

2:55 ***Peter Nsubuga, S. McDonnell, M. Otten, B. Perkins, R. Sutter, L. Quick, S. Cochi***
Impact of Acute Flaccid Paralysis on the Surveillance of Other Infectious Diseases in Africa

Background: CDC, the World Health Organization (WHO), and other partner organizations are collaborating to eradicate poliomyelitis. To monitor progress, countries perform surveillance for acute flaccid paralysis (AFP). The WHO Regional Office for Africa (WHO-AFRO) and CDC are also involved in strengthening infectious disease (ID) surveillance in Africa. We assessed whether AFP surveillance staff or resources were used in the surveillance of and response to other IDs in Africa.
Methods: In October 1999, we developed and pilot-tested a questionnaire on WHO and CDC staff assigned to15 of the 46 WHO-AFRO countries, representing four of the five WHO-AFRO epidemiologic blocks.
Results: Twelve (80%) of 15 WHO/CDC country-assignees responded. All 12 reported they had national AFP surveillance officers and nine (75%) had sub-national officers. In 11 countries (92%) AFP surveillance officers had been involved in detecting or responding to outbreaks of IDs other than AFP (including malaria, cholera, measles, neonatal tetanus, and diarrhea). AFP surveillance was combined with routine surveillance for other IDs in nine countries (75%). In five countries (42%) the AFP laboratory transport system had been used to transport specimens (i.e., serum, stool and CSF) for other IDs. AFP surveillance was specifically acknowledged to have led to strengthened ID surveillance in five countries (42%), improved surveillance infrastructure in three countries (25%), and increased training in surveillance and laboratory methods in two countries (17%).
Conclusions: These preliminary findings indicate that despite concerns about the vertical nature of AFP surveillance, it is already integrated into existing surveillance systems in many African countries. The funds, personnel, infrastructure, and training provided as part of polio eradication may be used to improve surveillance and response for other priority IDs in Africa.

3:35 Waterborne Diseases. Moderator: Suzanne C. Binder

3:40 ***Rachel S. Barwick, A. Uzicanin, N. Malakmadze, P. Imnadze, M. Iosava, N. Ninashvili, M. Wilson, H. Bishop, A. Hightower, D. Juranek***
Outbreak of Amebic Liver Abscesses — Tbilisi, Republic of Georgia, 1998

Background: In September 1998, we investigated an increase of amebic liver abscesses, a potentially fatal disease caused by *Entamoeba histolytica*, that has been rarely diagnosed in Tbilisi since the 1970s. The epidemiologic investigation was initiated to determine the risk factors for intestinal and hepatic amebiasis.
Methods: We conducted a case-control study and environmental evaluation of municipal drinking water in Tbilisi. A case-patient was defined as a resident of Tbilisi with a positive serologic test for amebiasis and at least one symptom/sign consistent with hepatic or intestinal amebiasis from June–September 1998. Controls were randomly selected. A standardized questionnaire was administered and blood samples obtained from case-patients and controls and tested at CDC by ELISA.
Results: Of 105 patients diagnosed in Tbilisi with amebiasis, 52 persons had liver abscesses (37 were confirmed serologically), and 53 had intestinal amebiasis (11 were confirmed serologically). Forty six of the 48 serologically confirmed cases were included as cases in the investigation. Eleven percent of control-patients had antibody to *E. histolytica*. Interruptions in the home water supply (OR = 4.52, CI = 1.03, 10.94), decreases in water pressure (OR = 1.49, CI= 1.05, 2.08), and increased water consumption during June (OR = 4.63, CI = 1.79, 12.02) and July (OR = 5.96, CI = 2.14, 16.59) were significantly associated with amebiasis. Filtration and disinfection of the city's surface water supply were found to be inadequate to remove or kill *E. histolytica* cysts (effluent turbidity 4–5 NTU, maximum CT=64).
Conclusions: Contaminated drinking water was the most likely cause of the outbreak, which could have resulted either from inadequate municipal water treatment or contamination of the water in the distribution system. Diagnosis of amebiasis by Tbilisi physicians was significantly compromised by lack of supplies.

4:00 ***Eileen F. Dunne, Y. Angoran, Y. Kamelan-Tano, S. Toussaint, B. Monga, L. Kouadiou, T. Roels, S. Wiktor, E. Lackritz, E. Mintz, S. Luby***
Is Drinking Water in Abidjan, Côte D'Ivoire Safe for Infant Formula?

Background: In Africa, as many as 15% of children born to HIV-infected mothers may be postnatally infected with HIV through breast milk. HIV transmission through breast feeding may not be prevented by effective prenatal and antenatal antiretroviral therapy. Recommendations for mothers to reduce the risk of HIV transmission by formula feeding may lead to increased infant mortality if formula is prepared from contaminated water. We determined water quality and water storage practices for households in neighborhoods served by a Projet RETRO-CI HIV maternal health clinic in Abidjan, Côte d'Ivoire.
Methods: We randomly selected 20 patients who attended the clinic and included their neighborhoods in the study. Within each neighborhood we randomly selected six households with at least one child ≤3 years of age. In each household, we administered a questionnaire to the caretaker and collected source and stored drinking water samples for microbiological testing.
Results: Eighty-nine (74%) of 120 caretakers gave the youngest child stored water for drinking. Stored water had lower levels of chlorine than source water (median 0.05 vs 0.2 mg/dl, p<.001). *Escherichia coli* was detected in 36 (41%) of 87 stored water samples and 1(1%) of 108 source water samples (odds ratio 76, 95% confidence interval 10.6–1522, p<.0001).
Conclusions: In Abidjan, drinking water for children is often stored and is commonly contaminated with *E. coli*, a marker of fecal contamination. Formula prepared from this stored water would be a likely vehicle for enteric infections. Household use of a safe water storage vessel and disinfectant could improve drinking water quality for all household members, and may especially benefit infants that are formula fed for prevention of postnatal HIV infection.

4:20 ***Sumathi Sivapalasingam, J. Ackelsberg, S. J. Olsen, P. Smith, B. Wallace, S. Kondracki, D. Dziewulski, R. Limberger, D. Schoonmaker-Bopp, B. Sauders, A. Mirtipati, A. Novello, D. L. Swerdlow***

A Large Waterborne Outbreak of *Escherichia Coli* O157:H7 and *Campylobacter* Infections Among County Fair Attendees — New York, 1999

Background: Temporary-use water supplies are commonly not regulated in the United States. In September 1999, an outbreak of *E. coli* O157:H7 (O157) and *Campylobacter* infections occurred among county fair attendees. Initial fairground site investigations identified a shallow, unchlorinated well which was unregulated.
Methods: Active surveillance identified fair attendees with diarrhea. We conducted a case-control study to identify risk factors for illness. Patients were fair attendees whose stool cultures yielded O157 or *Campylobacter*. Controls were randomly selected and age-matched fair attendees. Water samples were analyzed by polymerase chain reaction (PCR) and cultured for O157. O157 isolates were compared using pulsed-field gel electrophoresis (PFGE). A household survey estimated the attack rate among fair attendees.
Results: One thousand seventy-nine fair attendees from 19 New York counties and five states reported diarrhea. There were 74 hospitalizations, 13 cases of hemolytic uremic syndrome and two deaths. O157 was isolated from 109 stool cultures, *Campylobacter* from 57. In the case-control study, drinking water was associated with illness. Twenty-six (81%) of 32 case-patients drank beverages made from the suspected well water, versus only nine (16%) of 57 controls (matched odds ratio=23.3, 95% CI=6.3,86.9). O157 was detected by PCR, and subsequently by culture, from 3 well-water samples. PFGE patterns of O157 isolates from patients and two water samples were indistinguishable. The household survey determined that 9% of fair attendees developed diarrhea, suggesting that approximately 5,000 fair attendees became ill.
Conclusions: This is one of the largest outbreaks of O157 infections ever in the United States and was caused by consumption of unregulated well water. To prevent similar outbreaks, regulation of temporary-use water supplies, such as agricultural fairgrounds, should be considered.

4:40 ***Tara A. McCarthy, N. Barrett, J. Hadler, B. Salsbury, R. Howard, D. Dingman, C. Brinkman, W. Bibb, M. Cartter***

Hemolytic Uremic Syndrome (HUS) and *Escherichia Coli* 0121 at a Lake in Connecticut, 1999

Background: Hemolytic Uremic Syndrome (HUS) is commonly associated with *Escherichia coli* 0157. Cases of HUS and *E. coli* 0121 have been reported, but no outbreaks have been identified. In 1999, we investigated an outbreak of HUS and diarrheal illness in a Connecticut lake community.
Methods: To determine the magnitude and source of the outbreak, we conducted a cohort study and an environmental investigation. A case was defined as diarrhea (3 loose stools per day for 3 days) in a person who was at the lake during July 16–25, 1999.
Results: Information was obtained on 436 persons from 165 (78%) households. Eleven persons (2.5%) had illnesses that met the case definition, including three children with HUS. Illness was associated with swimming on July 17 or 18 (RR=4.7, p=.02 and RR=5.7, p=.01 respectively), as was swallowing water while swimming during these days (RR=7.0, p=.0003). The attack rate was highest in those aged 10 years who swam on July 17 or 18 (12.1%, RR=7.3, p=.0006). No common food item or drinking water source was associated with illness. *E. coli* 0121 was isolated from the stool of a child, outside the cohort, exposed to lake water. Six of seven case-patients tested had antibodies to *E. coli* 0121. Environmental sampling did not find toxin-producing *E. coli*. Water quality indicators were within recommended limits.
Conclusions: Our findings are consistent with a transient local beach contamination in mid-July, probably with *E. coli* 0121, which appears to be capable of causing outbreaks of severe illness. Recommendations included education, frequent water sampling, and consideration of alternative means for toddlers to use the lake facilities.

Friday Morning — April 14, 2000

8:30 Diseases Without Borders.
Moderators: Susan A. Maloney and Susan T. Cookson

8:35 ***Jane A. Rooney, J. Milton, R. Hackler, J. Harris, D. Reynolds, M. Tanner, E. Taylor***
An Outbreak of Measles in Southwestern Virginia

Background: According to 1998 data, it appears the United States may have eliminated measles as an indigenous disease; however susceptible citizens traveling abroad remain at risk. In September and October 1999, the largest measles outbreak in Virginia within a decade was traced to a U.S. resident infected outside the United States.
Methods: Local health departments within the Central Virginia district performed active surveillance and contact tracing. Laboratory-confirmed cases required a positive serology for anti-rubeola IgM antibody by the enzyme immunoassay (EIA) capture test. A clinical case of measles was defined as illness in a patient whose condition met the standard case definition and with an epidemiologic link to a laboratory-confirmed case.
Results: An unvaccinated male minister developed measles 4 days after returning from overseas travel. Fourteen additional cases of measles were confirmed during the following 7 weeks. Among these were five congregation members, the minister's three children and two health-care providers. Eight (53%) cases occurred in adults aged 30 – 35 years and seven (47%) among children aged 13 months to 8 years. Although no religious exemptions were cited, only one case-patient had documented proof of having received measles vaccine. Several others, including the health-care providers, thought they had been immunized.
Conclusions: This outbreak emphasizes the importance of vaccination coverage and retention of immunization records in the prevention of measles. It is imperative to ensure that a complete vaccine history is known, especially for international travelers and health- care providers. Travelers should be educated on the need to get vaccinations and boosters at least 4–6 weeks before travel.

8:55 ***Joseph F. Perz, A. Craig, W. Schaffner***
An Imported Outbreak of Parainfluenza Type 1 and Influenza B Associated with Tourism and Air Travel

Background: Tourism and airline travel are thought to play important roles in the introduction and spread of infectious diseases. On October 6, 1999, a pre-seasonal outbreak of influenza-like illness was reported in a church group that had returned to Tennessee on October 1 and 2 from a tour of Ireland. We investigated to determine the timing, extent, and nature of the outbreak.
Methods: A cohort study was conducted among the entire group. Nasopharyngeal and throat cultures were obtained and tested for respiratory viruses.
Results: A case-patient was defined as a group member with 1) a positive culture or 2) cough or sore throat with onset during September 29 – October 5. Eighteen (60%) of the 30 tourists were ill; 66% of case-patients had onset of illness within 1day of departure from Ireland. The median ages of the ill (64 years) and well tourists (60 years) were similar. The predominant symptoms were cough (78%), fatigue (72%), sore throat (67%), myalgia (67%), hoarseness (61%), and fever (56%). The median length of illness was 13 days. Although no hospitalizations or deaths occurred, 39% were seen by a medical provider. Parainfluenza type 1 was isolated from six cultures and influenza B from three. Tour group members with active illness returned to the United States on several flights and dispersed to Tennessee, New Jersey, and Connecticut.

Conclusions: This outbreak documented the importation of parainfluenza type 1and influenza B into the United States, including the first cases of influenza B for the 1999–2000 influenza season. This investigation highlighted the potential for the dissemination of respiratory illness via international travel.

9:15 ***Christopher J. Iverson, S. Wang, R. Ohye, V. Lee, H. Domen, S. Neal, D. Trees, P. Whiticar, P. Effler, Investigative Team***

Emergence of a Possible Endemic Focus of Ciprofloxacin-Resistant *Neisseria gonorrhoeae* in Hawaii

Background: Gonorrhea, the second most commonly reported communicable disease in the United States, causes pelvic inflammatory disease, infertility, and ectopic pregnancy. Ciprofloxacin, a fluoroquinolone antibiotic, is widely used to treat this infection. In contrast to Asian countries, where 10%–63% of *N. gonorrhoeae* isolates are ciprofloxacin-resistant (CipR), only 0.1% of U.S. isolates in 1998 were CipR. However, in 1998, the number of CipR gonococcal isolates sent from Hawaii to CDC for reference characterization increased fourfold from previous years.

Methods: In September 1999, we examined Hawaii State Laboratory records to identify all known CipR or ciprofloxacin-intermediate-resistant (CipI) gonococcal isolates since 1990. We then conducted a case-control chart review study of all patients with gonorrhea between January 1, 1998 and September 30, 1999 at the Honolulu Sexually Transmitted Disease (STD) Clinic. Patients with CipR or CipI (case-patients) were compared to patients with ciprofloxacin-susceptible gonorrhea (control-patients).

Results: Of 256 positive gonorrhea cultures in 1998, 27 (10.5%) were CipR/CipI, compared to 14 (4.8%) of 290 in 1997 (p=0.01). Ten case-patients and 131 control-patients were identified at the STD Clinic. Case-patients were more likely than control-patients to have had foreign exposure, defined as recent travel to Asia or a sex partner with such history (5/10 versus 12/119; OR 8.9, 95% CI=1.9–43.2). Four case-patients (40%) were Filipino and had no foreign exposure, compared with 14 control-patients (11%) (OR 6.6, 95% CI=1.3–33.6).

Conclusions: This investigation confirmed a large increase in CipR/CipI gonorrhea in Hawaii. The increase appears due to importation from Asia and possibly to a local endemic focus. These findings resulted in the recommendation that fluoroquinolones, such as ciprofloxacin, no longer be used to treat gonorrhea in Hawaii.

9:35 ***Michael B. Curtis, E. Steinberg, S. Lipsky, E. Debess, P.D. Vertz, J.C. Mohle-Boetani, J. Buxton, S. Wong, R. Gautom, J. Duchin, L. Slutsker, J. Kobayashi***

Outbreak of *Salmonella* Serotype Muenchen Infections Caused by Unpasteurized Commercial Orange Juice — United States and Canada, 1999

Background: Fresh-squeezed juices and ciders are effective vehicles for transmission of a variety of pathogens including *Salmonella*. However, current U.S. Food and Drug Administration regulations do not require producers to include a final killing step (e.g. heat pasteurization) in the production process. In June 1999, three patrons of a Seattle restaurant chain were infected with the same strain of *Salmonella* serotype Muenchen after consuming blended fruit drinks. We conducted an investigation to determine the source and extent of the outbreak.

Methods: A case was defined as any illness occurring during June or July, 1999, caused by infection with the outbreak strain. State and provincial public health laboratories identified cases from *S.* Muenchen isolates. A case-control study was conducted among the Seattle restaurant patrons; control subjects were identified from Seattle/King County employees using an e-mail questionnaire. Orange juice production was investigated, and samples were tested for *S.* Muenchen.

Results: A total of 360 cases, including 40 hospitalizations and 1 death, were identified among residents of 16 states and 3 Canadian provinces. Among 110 case-patients in Washington, 104 reported diarrhea; 77 reported fever; and 44 reported bloody diarrhea. Illness was associated with consuming unpasteurized orange juice from an Arizona company served at the restaurant chain (30 of 36 case-patients versus 13 of 56 control subjects [odds ratio=16.5; 95% confidence interval= 5.1–57.6]). Orange juice squeezed in Mexico was trucked to the Arizona company, mixed with Arizona juice and packaged for distribution. *S.* Muenchen was isolated from orange juice in a Mexican tanker truck, in holding tanks in Arizona, and in sealed gallon containers in Seattle.

Conclusions: This is the largest unpasteurized juice-associated outbreak recognized to date and it likely could have been prevented by incorporating a final killing step prior to packaging the juice.

Friday Afternoon — April 14, 2000

1:30 Iatrogenic and Nosocomial Illnesses. Moderator: Jerome I. Tokars

1:35 *Chesley L. Richards, R.P. Gaynes, J. Edwards, D. Culver, the National Nosocomial infections Surveillance System*

Surgical Site Infections Following Cholecystectomy in the United States — The Impact of Laparoscopy

Background: Since its introduction in the 1980's, laparoscopy has replaced the open cholecystectomy as the preferred technique for most of the 400,000 cholecystectomies performed in the United States each year. Little is known about the impact of laparoscopy on surgical site infections (SSI) following cholecystectomy.

Methods: We analyzed data from the National Nosocomial Infections Surveillance (NNIS) system from 1992 to 1997 to determine risk factors for SSI following inpatient cholecystectomy.

Results: For 42,734 cholecystectomies reported to NNIS, the overall SSI rate was 1.05 per 100 operations. In univariate analysis, the SSI rate was lower for laparoscopic cholecystectomy compared to the open technique (0.64 vs. 1.77 per 100 operations, p value=0.001). The SSI rate was higher for males (1.78 vs. 0.76, p=0.001), American Society of Anesthesiology (ASA) score of $\geq$3 (1.84 vs. 0.70, p=0.001), surgical wound class of "contaminated" or "dirty" (2.23 vs. 0.96, p=0.001), emergency procedures (2.08 vs. 0.93, p=0.001), multiple procedures through the same incision (3.15 vs. 0.81, p=0.001), surgeries > 2 hours (2.18 vs. 0.78, p=0.001), and patients $\geq$ age 65 (1.62 vs. 0.80, p=0.001). In logistic regression analysis, each of these factors remained independently important. Even after adjusting for sex, ASA score, emergency surgery, multiple procedures through the same incision and age, laparoscopy remained associated with significantly lower risk for SSI than did the open technique (OR 0.63, 95% CI 0.51–0.78, p value=0.001).

Conclusions: The overall rate of SSI is significantly lower when using the laparoscopic technique, even after adjusting for other known risk factors.

1:55 ***Tejpratap S. Tiwari, R. Wallace Jr., K. Jost Jr., B. Ray, K. Hendricks***

Postinjection Joint Infections Caused by Mycobacterium abscessus — Texas, 1999

Background: In July 1999, a cluster of patients with postinjection joint infections caused by *Mycobacterium abscessus* was reported in Texas. All patients had been seen by the same family practitioner and received intra-articular steroid injections during the preceding four months. We conducted an investigation to identify the source of these infections.

Methods: We reviewed the injection procedures at the practitioner's clinic and collected data regarding patients who had received intra-articular injections during April 1 – June 30, 1999. Environmental specimens were sent for culture. We compared patient and environmental isolates by using pulsed field gel electrophoresis and random amplified polymorphic DNA-polymerase chain reaction. We also asked laboratories statewide to review their records for additional cases.

Results: Eleven (19%) of 58 patients who received intra-articular injections developed postinjection infections involving the knee (n = 5), heel (n = 4), shoulder, and elbow. We isolated *M. abscessus* from specimens of 9 (82%) of the 11 patients and from 4 (14%) of 28 environmental specimens. The four positive environmental samples contained benzalkonium chloride that was used to clean each patient's skin prior to injections. Against the manufacturer's instructions, the practitioner had diluted the commercial product, using nonsterile water. The resultant solution was poured into jars containing either unsterilized cotton balls or gauze and then used over a prolonged period of time. *M. abscessus* strains from the patients and environmental isolates were indistinguishable. No cases were reported from other Texas laboratories.

Conclusion: We believe that the benzalkonium chloride became contaminated with *M. abscessus* during or after dilution. The organisms were probably inoculated into the patients' joints during the injection. Future outbreaks can be prevented by using antiseptics according to the manufacturer's instructions.

2:15 ***Alan H. Ramsey, T. Beyer, T. Török, J. Davis***

Outbreak of Bronchoscopy-Related *Mycobacterium Tuberculosis* Infections — Wisconsin, 1999

Background: Although bronchoscopy-related transmission of *Mycobacterium tuberculosis* infection is rarely reported, its incidence is likely underestimated. In August 1999, five *M. tuberculosis*-positive bronchial washing cultures were noted among patients having bronchoscopies in July in a hospital that reported only eight *M. tuberculosis*-positive cultures during 1995-1998.

Methods: A case was defined as a *M. tuberculosis*-positive culture from a bronchoscopy patient during January-August 1999. Bronchoscopy and laboratory records, procedures and practices were reviewed. *M. tuberculosis* isolates were compared using restriction fragment length polymorphism (RFLP) analysis. Bronchoscopes were serviced by the manufacturer.

Results: During July 1999, 18 bronchoscopies were performed on 18 patients. Bronchial washing specimens for mycobacterial culture were obtained from 17 patients. Ten cases were identified. Two case-patients, including the index, had signs and symptoms of tuberculosis prior to bronchoscopy. Two other case-patients developed *M. tuberculosis* infections despite starting a standard 4-drug antituberculosis regimen within 3 weeks after bronchoscopy. Six case-patients were culture-positive but had no evidence of infection. All *M. tuberculosis* isolates tested, including one from the index patient, were fully antituberculosis drug-susceptible and all but one were indistinguishable by RFLP analysis. Three bronchoscopes were used; one was used in 9 of the 10 case-patients (Relative Risk=6.0, 95% Confidence Interval=1.0-35.9). Leak testing, a critical reprocessing step, was not routinely performed; the manufacturer discovered a hole in this bronchoscope's sheath using the leak test.

Conclusions: *M. tuberculosis* contamination of the bronchoscope occurred during the index patient's procedure. The hole in the bronchoscope sheath provided access to an environment that was difficult to

mechanically clean and chemically disinfect. Bronchoscope manufacturers' reprocessing recommendations, including leak testing before and after each use, should be followed closely.

2:35 ***Gérard Krause, S. Whisenhunt, M. Trepka, D. Katz, O. Nainan, S. Wiersma, R. Hopkins***
Patient-to-Patient Transmission of Hepatitis C Virus Associated with Use of Multidose Saline Vials in a Hospital

Background: Hepatitis C virus (HCV) is the most common chronic bloodborne infection in the United States, but nosocomial HCV transmission has been reported rarely. Three patients were diagnosed with acute hepatitis C within 6 weeks after having been admitted to the same ward of a hospital in Miami during November 1998.
Methods: We conducted a cohort study of patients hospitalized during November 11–19, 1998, on ward A. We interviewed patients, abstracted records, and tested blood samples for anti-HCV. HCV RNA-positive samples were genotyped.
Results: Twenty-one (51%) of the 41 patients who were hospitalized were available for interview and testing. Five patients had infections with HCV genotype 1b. One patient, the probable source-patient, had chronic hepatitis C before being hospitalized, whereas the other four patients had no evidence of prior HCV infection. Three of these case-patients had acute hepatitis C. Among 8 patients who received saline flushes of intravenous catheters within 2–6 hours after the source-patient, 4 (50%) had HCV infections; among 12 patients who did not receive saline flushes within 2–6 hours after the source-patient, none had HCV infection (Fisher exact test p=0.014). We identified no other significant exposures. The nursing staff used multidose vials for saline flushes, but reported changing syringes between each patient.
Conclusions: HCV was probably transmitted from a chronically infected patient to four other patients after a multidose saline vial was contaminated with the source-patient's blood, possibly by accidental reinsertion of a contaminated needle. Hospitals should emphasize proper adherence to infection control procedures. The use of single-dose vials or prefilled syringes for saline flushes might further reduce the risk of nosocomial transmission of bloodborne pathogens.

2:55 ***Willie J. Parker, G. Chavez, J. Rosenberg***
Public Health Response to Needle Reuse by a Phlebotomist — Northern California, 1999

Background: Infection risk after needlestick exposure to infected blood varies by bloodborne pathogen (BBP): human immunodeficiency virus (HIV) 0.3%; hepatitis C virus (HCV) 3%–10%; hepatitis B virus (HBV) 30%. In March, 1999 a phlebotomist working for a large commercial lab in California violated procedure by cleaning and reusing needles between patients. We reviewed the events, notified clients, offered testing, and estimated the seroprevalence of BBPs in the group potentially exposed to this practice.
Methods: Clients exposed to the phlebotomist from August 1994 to March 1999 were identified, contacted by letter, and invited to be tested for HIV, HCV, and HBV. Prevalence for each pathogen was determined among respondents and compared to seroprevalence data from the National Health and Nutrition Examination Survey (NHANES III). Seropositive patients were queried about risk factors and the phlebotomist was interviewed.
Results: Of 11,749 persons notified, 4,789 (41%) were tested. The tested group was 57% female with a median age of 51 years (range: 14–83). The serological results were HIV, 0.2%; HCV, 1.0%; and HBV, 0.5%, the same or lower than national estimates (NHANES III: HIV, 0.3%; HCV, 1.8%; HBV, 0.5%). Of 71 persons seropositive for a BBP, 46 (65%) persons could be interviewed; 21 (45%) had at least one risk factor for a BBP. The phlebotomist claimed to have only reused needles "7 times" after washing them with peroxide.
Conclusions: Although the baseline prevalence of BBPs in this population is unknown and the tested group did not include all persons potentially involved, because the prevalences were so low we concluded that disease

transmission was unlikely despite the breech in infection control technique. We did not recommend any specific medical follow-up.